I think I can explain why most things keep getting worse. I think there's an explanation for why the IPCC and COP have been doing their things for so many years and yet CO2 growth keeps *accelerating*. It's the same reason governments are more populist and we're all getting sicker, and why we have more wars, hunger, inflation and movie sequels than just a few years ago. I think we can even explain why global overshoot ever got as bad as it has, and the worst thing is that as complicated as these problems are – the driving force might be quite simple.

It appears as if there's a problem in humanity. Specifically, in our minds. And unfortunately until you look at enough datapoints, it's not going to be clear to you. Because you're not looking wide enough.

Let me show you something:

	Was	Now
Methane Hydrate destabilization begins somewhere *(oceans/bottom marine heatwaves)*	>2100 (or much more, depending. Centuries)	Now, at shelf depths
AMOC 'collapse' (ie some large loss of function like 40%) *(oceans/AMOC-letter)*	>2100	~2050 is 50%
Collapse of Thwaite's Glacier *(cryosphere/Collapse of Thwaite's)*	2090	By 2026
Time scale for deep sea heat changes *(oceans/bottom marine heatwaves)*	Decades or more	Months (ie, heatwaves possible)
Antarctica subsea permafrost destabilizes *(oceans/Antarctica methane release)*	After Thwaite's, so likely >2090	Now
>.25C jump in ocean sea temp *(oceans/ oisst2.1_world2_sst_day.png)*	~20 years	1 year (2023)

What do you see when you look at this? Six updated predictions yes, all that have moved within the last 4 years. Is it just a display of increased ocean heating? Maybe surface waters? Well that can't be it alone, as some items like the AMOC and hydrates are more about heat distribution than heat itself, and Thwaite's is at least partially on land.

I think what's most eye-catching to me about these items isn't that they're about heat, or that they're updated, but that they're all updated *in the same direction.*

It appears in each instance a prediction has been made for a system and when that system might shift to a new state, and in each one of these cases that update has been towards ‘more of a danger.’

I think I can prove to you this isn’t random. Something is going on here, and it directly relates to the state of the world.

Big picture: What sits before you now is a lone researcher’s project on how a pervasive conservative bias has spread throughout the world we’ve built in such a way that the true size of ecological overshoot has been hidden from us all. My plan is to give you tools to spot this bias, for us to attempt to correct for it, and when we do I’m afraid that I’m also going to have to show you a general collapse of the Earth system, just sitting there right in data already published.

This is a system review of as much of Earth as I can, or maybe an expansion to Limits to Growth from data, made because no one is paying to do these things anymore. In practice our synthesis is going to show events we once thought were far into the future are not. They are in fact often happening *right now*. Deep ocean heatwaves, methane hydrates disassociating, major governments falling, all are current events and there’s a clear reason why.

We’ll go over this in detail, and I show you both method and application of theory, so that you can scorecard and determine for yourself.

But first some notes –

-The datapoints we are going to use in this project are all peer-reviewed, from primary researchers, or from government agencies. There will be a few NGOs, but only very few. The reason there are so many? It’s not until the scale becomes obvious that the magnitude also comes into focus.

-There is no new research here, and I claim no ‘special’ knowledge. I have no agenda and will leave no contact info. No patreon, no nothing. This is just a theory, shared freely.

-This synthesis is not linear, and feel free to skip around. I am deliberately informal, and trying to make the material accessible. Jump wherever you want. Use the simple table of contents. Go back to things and go to the support documents constantly. I have only highlighted the very most obvious connections for you, but rest assured there are many more. Go looking.

-I do not refute the scientific process or climate change, or even focus on only climate change. We will cover all sorts of systems and their interactions, but we will also go multi-domain.

-Yes, we will absolutely be talking about societal collapse but only when it becomes the obvious conclusion of the bias in action. Time and again it’s going to show up, and that’s really not my fault. I’m using numbers provided by the IPCC, or the WWF, or James Hansen, and if you think there’s cherry-picking your beef will need to be with them. Full papers are included.

Finally, let me admit now I have no solutions for you and that some of this material will be emotionally difficult. It has to be, that’s why the bias exists. Unfortunately, it seems the human race has sleep-walked right into an apocalypse, and all I can do now is show it to you. In existing data.

Shall we begin?

A heuristics approach

I understand completely how big it is to claim a connection between so many events and THEN also state an (ongoing) collapse. I'm not being hyperbolic either – which means something pretty big must be going on right?

Simply put I am going to define conservative bias here as a tendency for humans to assume values for the unknown, and rather than place that value somewhere random, put it instead where it is more safe and unthreatening.

My theory is that the reason all the examples in the table got revised in the same direction (faster than expected) is because most of our conservative bias manifests in the same way. We humans like to put theoretical danger *further away than it really is*. And we do this…everywhere, all the time, and I think you be aware of it in your own life but maybe don't assess just *how much* you do it.

And since this problem is likely a biological quirk of our species (which is why it's everywhere, not just one or two cultures), I assert it is more prevalent (widespread) and powerful (magnitude) than is generally recognized. And btw, I make no claims about the historical nature of this bias. The datapoints we're using really only go back to 1970 or so, and so we're going to focus just on the modern world.

So what is this conservative bias? Where is it, how does it hide, and how do we assess it?

I have a simple relationship equation for you:

(assumptions) + (application) + (synthesis) = (conclusions)

This is our core of empirical science, our nice little model to get some work done. But here's another way to consider this equation:

(wrong assumptions) + (wrong application) + (wrong synthesis) = (size of possible error)

In this version we see that one error, put up with an error, starts to grow error at the other side of the equation.

In the same way I assert conservative bias exists in two primary forms that are compounding together:

1. Inside of a domain – this would be when someone makes a bad prediction on aerosol forcing, and then climatologist goes along with that number

2. Outside of a domain – this is multi-domain synthesis, when no one even bothers to add up microplastics + pfos + nitrates acting together

Ok, great, so there's a potential for error to build up in a system. We understand that, but how do we spot it? And how does this lead to a global problem?

I have thought about at different points putting together a theoretical exploration of bias in the individual, in the institution, and in society here. I also considered formulizing how to measure bias in each of its two forms, an equation to constrain the magnitude of bias sort of thing. But I've decided against all that.

Why?

Because this isn't a formal publication, and because I think if I tried to do that, it would take too much time. And worse, it would silo this work more. Make it less approachable.

And I truly mean it when I say I think we all don't have much time left, and that everyone everywhere should be given a chance to see what we've done.

So here's what we're going to do:

We're going to fix science (because it is the best tool we have, it just needs calibration) in a quick and easy way, and then we're going to take this fix and turn around and immediately look at the data, and you can start seeing if I'm right or not. We're going to correct for this bias I'm claiming, and see if the correction makes things a bit more obvious for all of us.

Rather than something complicated and formal then, we're going to need something fast and memorable that we can keep referring to – a heuristic.

A heuristic is a sort of verbal algorithm, not as formal as an equation but better than just a general phrase like *its worse than you think*, or *faster than expected*.

At the root of this entire document is a fear from the author that everyone else isn't afraid enough. That the human race is so avoidant of fear (or perhaps attracted to safety) that we have pushed it away when it should be closer. That we're refusing to admit our ignorance.

So that's a good place to start. It also happens to be the foundation of empirical science.

3 Admit Radical Ignorance

If there's a problem here to solve, our investigation begins with us admitting that nobody really knows anything firmly. Science is all about figuring out, and so let's acknowledge that. Before anything else from me, let's just acknowledge we need to question everything. Question the documents I give you, question my theory, question my interpretation, question me, but also remember you should question everything else too.

Our next step then is to start addressing my fears, my conservative bias theory. How do we go look for it? Let's start by assuming it's there at all, and that it's big, and then we can see if it really does show up or if we're holding nothing by the end.

2 Acknowledge sometimes humans might be using answers we want

This conservative bias is all about fat-tail risk. It's about the idea that people might be putting events further away from them than reality, just like in the table at the

beginning. I'm not saying their making intentional errors exactly, but just that institutions, societies, disciplines all have the potential for bias.

Imagine for a moment a radiologist sees something bad on a daily review of scans. He's going to use language to describe it to a GP, and then that doctor will have to tell the patient. And then the patient has to tell his child. But now imagine that at every stage of that chain, the language that is used gets softer. Gentler. More kind.

That's the conservative bias inside a domain – we didn't have to get anyone else involved, but at every point in our own chain we maybe altered the data a bit.

But we've got that other form of the bias I mentioned too right?

Let me ask, do you think in general there is a connection between general amounts of chemical pollution in the world and disease rates in the human race? Thalidomide causes birth defects, and the more Thalidomide there was the more birth defects there were in the community, so yes, right? But can you find any studies that just map 'here's how many chemicals a country produces' vs 'here's how much general sickness that country has'. Just a very general chemicals produce vs diseases in action. I can't find anything like this, and yet it's just so obvious.

Likewise, remember our table at the beginning, and how everyone was wrong in the same direction? Have you considered that everyone had to move faster because of a single factor (say a rise in earth's energy imbalance)? Or what if that **isn't** the case, and instead…the guy calculating ice loss in Antarctica suddenly has to account for each of weaker currents, Thwaite's buckling, and heatwaves under the sea ice. All at once this guy has to become a master in multiple physical domains just to make sense of what he's seeing.

This is multi-domain study and it's something we do (as we'll see) little of in the modern world. Organizations like NOAA and the IPCC are famous for doing these, but they do seem to be getting less funding these days…Do you think that might be a problem?

3 Look up (ie, what does this mean for everything else?)

We're going to do a lot of systems level reviews of things in this piece, entirely because no one else is, and this is where the third part of heuristic comes into place. This is the conservative bias where instead of making errors about the little things, we don't even bother to do a synthesis at all. It's just unknown.

Do you think nanoplastic particles building up in brains could contribute to a rise in populism? Nanoplastic particles do cause inflammation in some tissues, and brain inflammation does cause erratic behavior. Could that be a contributing factor? Probably not right?

But how do we say that with any confidence? That's a conservative bias and the worse part is, here we just make an assumption because no one is *studying it at all*.

So here we have 3 quick heuristics I'd like us to use when we go look at some data.

4 Admit Radical Ignorance

5. Acknowledge sometimes humans might be using answers we want
6. Look up (ie, what does this mean for everything else?)

In practice these heuristics are going to be a lot like ‘keep an open mind’, but more specific. We’ve got a process here. First we realize we can question everything (especially ourselves and our assumptions). Then we ask hey, is there some value here we might just be *assuming wrong*? And then finally we loop up and we ask, what does this mean for global warming? Or for failing nations? Or for the Limits to Growth?

And that’s it. Now let me show you what doing this reveals…

Atmosphere & Solar

EEI

(Here's what we're going to do now. I'm going to go through the domains as listed in the support documents, and speak to what I see. But this isn't going to be a deep dive or a walkthrough of each subject. This is going to be pattern recognition. Be warned I will jump around a lot. I will ruminate and ask questions without answers – and that's the point. I said this problem was everywhere so we're going to go wide to assess it. Go at your pace. You have the data now; you have the heuristics. Apply them with me, and ask, is there a pattern here? It's not about individual claims, it's about why are there SO MANY examples of observations proving to be worse than our predictions or models? Pretend I'm with you, speaking to you if it helps, but I will not be explaining each detail or labelling every citation. You will need to do your homework to keep up.)

Earth's energy balance has increased at something like .45w/m2 per decade for at least 2 decades. The EEI represents the amount of solar energy into the earth system, versus the energy we bounce back out of it, and as Earth's albedo drops more energy will enter our atmosphere. This leads to a feedback loop as melted ice means less albedo, less clouds (of the right type) means less albedo, and even darker oceans due to worse mixing means, you got it, less albedo.

Heat in other words, often makes more of the conditions that will add more heat to earth.

This is bad enough - but what if I also pointed out that while this general framework has been understood for some time, for 20 years now ever major institution has been measuring this amount *wrong*. Either that, or just assuming it's value wrong without measurement.

And it looks like we've miscalculated by quite a lot.

(we have a lot of references here, but best is probably atmosphere/GjsklHGXEAAh9z2.jpg)

The IPCC AR6 had some estimations of EEI and possible earth climate sensitivities (ECS) they've been using for a long time, and CERES now shows we've tracked above all of these for the entire time (well, excluding one brief year – 2014). Or particular note here though, not only have we been above all possible pathways the IPCC considered, but the one they really used for most scenarios was the green line. This means all the majority of IPCC pathway scenarios are based on wrong assumptions, and always have been. So IPCC pathways, the 1.5C and 2C predictions as example, are based on a cooler planet than ours. Let that sink in – EEI is the literal base force that is causing our planet to heat and the IPCC hasn't had that base driver right, or even close to right, for 20 years.

So wrong measurement, wrong assumption, lasting for the entire time of policy, right out of the game. Please go look it up yourself and then we'll resume our bias hunt.

Good? Ok, let's go.

So all the IPCC predictions made on heating have been at least partially wrong. But that's just one organization right? Sure it's the primary multi-domain international one, but just one. Does this matter? It does when they're the yardstick unfortunately.

Follow this logic – so far in the 21st century we humans have been pretty good as human at anticipating historical temperature changes. Seriously, until 2023 at least a year hasn't come along where our predictions were completely off, and usually we can get it right down to hundredths accuracy.

EXCEPT now we know that when the IPCC was doing its predictions, or anyone else using their numbers, we had one of our basic numbers in the equation wrong.

So how were our predictions turning out correct?

I see some primary causes here. More than just one of our numbers in temperature calculation is likely wrong (more than just the EEI), AND until 2023 most of the numbers we've been dealing with were small, so errors were a lot easier to hid.

On the first point, if our heating forcing is wrong but our temperature predictions were right, we had to be wrong somewhere else in a way that 'balanced' out the wrong forcing. Hansen believes our understanding of aerosols was also wrong (atmosphere/Global Warming Has Accelerated), so that they generally cooled more than the IPCC assumed and that his bigger cooling them cancelled out the bigger heating to produce the number we use today. And that this balanced error worked fine until 2023, when SO2 aerosols were removed from shipping and whoops, we found out what's really going on.

The second point is simply, when the temperature change was something like .11c/decade, nobody was quibbling over a prediction that was .01c off. That's surely within natural variability yes? It's only when systems start to accelerate away from the baseline that variance really grows.

BTW, I might accusingly point out that if we understood the system at scale, we shouldn't have errors of any magnitude. And that every time an error DID show up, we should have worked damn hard to find out why. (Heuristic 1 and 2)

Regardless we are where we are now.

So what next? Well that EEI number is large, and it represents a lot of energy into the system. And we've only noticed the size of our error since 2024. So we need to do some catching up at the very base of the global warming tree (which means updating everything else).

I do hope Hansen is right. I am not sure that it's entirely the case, but if it's as easy a balance as lifting aerosol forcings up to match this increased heating that'd definitely make the math easier. But I distrust what's easy, and I think on what else we may have missed with heating that much stronger. Maybe our measurements of albedo are wrong – just like the satellite data itself might still be. I mean we were using one figure for 20 years that was wrong, yes?

What about how we calculate EEI at all? Generally we do it in w/m2, but have you thought about that? We're partitioning the earth into little blocks in that calculation, and then trying to generalize a value of energy equally to each one of those patches. And sure, aerosols balanced out the heat before, but what happened in regions without aerosols? Sub 40S in the southern hemisphere there are very little aerosols, and so the waters there have had more heat on them for decades then assumed. Would that throw off our calculations of ice loss? Could we have been losing more ice than calculated from just this error?

Aerosols don't cover everything evenly, and so if our math is wrong on the EEI that would mean we can't 'average' it out so easily. Some places with aerosols would get especially strong cooling, and the places without would be much much hotter. What happens if we assumed that the amazon rainforest was getting less sun than it really was? Maybe we think the forest is more resilient than it is. Likewise, maybe we think Europe or China or India are actually LESS susceptible to heating than they are due to strong aerosols?

We get an uneven picture from this answer and that is if the answer is the whole picture. Again we are wrong.

This is the third heuristic in action. We were wrong, we did a bunch of wrong calculations, and now we've let those wrong calculations give us perhaps a wrong systems picture.

Aerosols themselves

No one knows how powerful aerosol effects are in climate change. Yes, we just spoke about SO2, but here we're talking about all 'aerosols', or even just 'tiny particles added to the air'. How many of these particles are there? What are they all like? We don't know. We don't know at what height, from what angle, in what situation, and so we create bell curves to 'normalize' all possibilities.

(atmosphere/ IPCC_AR6_WGI_Figure_7_6.png & aerosol measurements are good here)

The above is the IPCC AR6 estimation, but Hansen and Simmons contend that this is an underestimation. Specifically, they point to the reduction of SO2 in shipping fuels (2020 in north pacific, 2025 in the Mediterranean) as an example of the aerosol cooling effect being stronger than generally assumed. This is another way of looking at the EEI we assessed, but notice here it's a 'combined' forcing, so when SO2 is a bigger value, all aerosols go up. But what if some of those other particles (and there are thousands) are ALSO different than we expect? Bigger, smaller, and all of them changing the general balance in subtle ways?

Of particular interest in assessing this possibility is how SO2 clears from the atmosphere inside of weeks at most, and sulfates by 22 months or so. These are general values and we can doubt them, but let's use them for a moment.

The timeline for a burst in heating in earth's oceans that started in 2023 and the reduction of SO2 in shipping fuels at the end of 2020 does partially fit then, right? But only partially in my eyes. As example while the EEI anomaly does grow suddenly in 2020, the reduction in shipping aerosols was only in the North Hemisphere and then mostly in the Pacific, so regional. Additionally, sulfates generally take at MOST 22 months to clear, meaning that the heating that resulted from their reduction should have been started showing up well before their full reduction. Similarly, if the aerosol reduction was the primary driver of heating in 2023, then the EEI increase which drove that heat should actually have appeared even before that.

But do we see it?

(atmosphere/Global SO2 & ASR.png)

There are definitely some signs of it certainly, and definitely in the region as a whole we get strong signal. Still ocean temps themselves only 'explode' in 2023, not along with the EEI. This makes me suspicious that the heating burst is ONLY aerosols. In fact I might go so far as to say my suspicion is that aerosols might be the single biggest component, but are small compared to the pure amount of forcings that likely have been in the waters both prior and post the 2023 burst. But we'll get to that.

(atmosphere/Aerosol forcing by year.jpg)

When we investigate 2023 and 2024 I always like to play, what *else* could explain what we see? Could other aerosols be at play? Maybe there's something that we're not tracking, or more aerosols of a different type that do something else? We're already looking at one aerosol factors here, why not consider the rest?

(atmosphere/ EEI 48 month.jpg & NPA EEI2.jpg)

And what do you make of overall EEI estimates in light of this? Because here in the 48 month running mean we see no signs of a pulse at all, even though by 2025 we should have 3 years of it. And even as the EEI in the pacific was driven more by falls in the PDO than by anything else?

I don't bring these up for any particular conclusion yet, just to give you a sense that trying to figure out something like air temps is going to involve ocean temps, aerosols, and sun estimation at minimum. And we really we've only been talking about constraining SO2/sulphates so far.

So what about all the other chemicals not tracked? The more exotic compounds that the IPCC has their range of forcings for sure, but then you find out there are some not in there? Like did you know microplastics, which now can be found in air samples, aren't considered at scale for their possible heating or cooling properties? How preposterous is that? They're now in all our air samples, but not enough in our air for aerosol calculation? No, it just hasn't been done.

And what about the chemicals that leak into the air that shouldn't (like air conditioning gases), or build up where they shouldn't (like those suspended over heat domes), or don't clear quickly? What about the compounds that form when chemicals react with heat or water in the air? I rarely see those modelled, and even when we talk about EU COMPOUNDS (in chemicals section) they don't tend bother tackling air combinations.

(note, there's also a connection between aerosols and cloud feedbacks. We've seen signs of this already just in the IPCC and James Hansen examples we've used, but please go read more in the atmosphere section. We'll talk about the cloud feedback for heat separately, but when it comes to odd chemicals and clouds…there's not a ton of work. So this will have to be an unknown unknown.)

And all of this has just been man made aerosols. What about natural ones - fire and volcanos especially?

76.3 Tg of carbon dioxide was one measurement of the Canada fires of 2023, but that was just the carbon. Assessing the effects of the actual aerosol dispersion from smoke is nightmarish, and I won't pretend to tell you what it's definite effects were, but work with me here:

If that fire year was the greatest yet recorded, and aerosol effect correspondingly large, what interplay do you think it had with the 2023 'heating' pulse? The articles I've found all suggest the effects of those black soot particles were minimal and transitory, but I remain unconvinced given that the area under effect was about as large as the SO2 shipping fuels were. I suppose it's possible that again, positive and negative forcings from such an event 'mostly' evened out, but do we know?

Isn’t it odd that we just assume 5x magnitude fire year has no more effect on the air than a normal fire year?

Black carbon falling on ice may be a feedback itself, but here at least I see no evidence that ice loss that years was particularly bad. Did we get lucky?

Food

So, let's get into food for a moment. Because if climate change and pollution are visibly linked, climate change and food should be just as simple no? Heat goes up, the crop either likes it or doesn't, and we get a different yield.

It is, I think, worse than that.

Let's start with a story – down the road from my ruralish home, about 200 yards away, is a large blueberry farm. They do very good work here and make some very delicious blueberries, and as you walk down the road you can get within a few feet of the trees as the (super friendly) undocumented workers toil day after day to make the crops perfect.

The thousands of plants are usually placed in long rows that are labelled by variety, and from the road you can clearly see which lanes are marked as 'organic' or not. The workers spray the nonorganic crops regularly, and sometimes the smell of their compounds (whatever they are) reach my house for a few hours.

What's of interest in this story is that the blueberries labelled as 'organic' are about five feet away from the other ones as they get their weekly spray.

Along the same line, just a bit further down this country road we've discussed, and still right there on the border of the berry fields, is the local state highway. I've counted the traffic on this road and on a slow day there are at least 4 cars per minute, and on the weekends usually dozens.

So yes, not only are the organic berries getting some amount of spray, but they are maybe 15 feet away from constant traffic? Sometimes there will be a spindly hedge between them and the cars, but given I can smell diesel exhaust at my home regularly, hedges likely aren't helping.

Please understand I am not disparaging the berry farm. It is well regarded, consistently wins awards and the people who run it are lovely.

And yet every organic berry they grow just has *less* pollution and artificial chemical exposure than the rest. Not none, just less. And perhaps even more tire/car exhaust exposure.

Rising Hunger

Historically food and foreign aid programs have been remarkably successful. It's often a bit mind-numbing as an individual to hear about them for year after year, decade after decade but it's absolutely verifiable that worldwide food insecurity was on a steady decline from the 1950s til at least 2008. There is some definite noise in the 2010s, food insecurity rising in some first world nations for example (particularly the UK & USA), but even then mostly rises. Then COVID.

It's easy to blame many changes in hunger on the pandemic and what it did to supply chains, and maybe perhaps the food will begin to flow back into nations again soon. But so far from 2020 to 2025, food availability has fallen in a sharp

series of steps, one after another. Not just COVID, not just the war in Ukraine and sudden changes in sellers/markets/costs there, but also the war in Sudan, in Myanmar, in Gaza. Suddenly nations are leaving the African congress and droughts of not just a season, but of multi-year have started to appear (Africa, Australia and Central America all). Multiple hurricanes hit Madagascar through to Malawi year after year (23/24). And then in 2025 the US threatens food aid overseas, reverses course, reverses again, and Middle East war flares to even more nations.

I've found it hard to pinpoint when famine first started its return.

Authentically it might not ever have left, despite the media narrative – it seems we don't really care about each other enough as humans to exhaustively research and intervene in starvation, let alone to categorize accurately. There have been well-documented past famines and food aid has allowed many citizens worldwide in this situation to take assistance for a few years, stabilize their lives, and then not need that aid again. There has never been a long 30 years worldwide of constant 'we feed the same people year after year in the same place' scenario that I can find. Hunger has never gone away true, famine did not seem to 'linger' anywhere outside of active warzones.

Then the Congo, the whole of southern Africa's droughts, Venezuela, Cuba. Added of course to the new wars in Yemen, Gaza, Sudan, Tigray, Myanmar. The world report suggested 581 million people in malnutrition in 2019, but 733 million in 2023.

Famine records are harder to quantify, but of interest in 2024 famine was guessed at 1.1 million individuals (not including Gaza). This is a historical high for the last decade, and has been increasing every year since 2020, and that's using 'official' UN figures. In reality, as normal, a full synthesis is entirely resisted.

For example, the whole of Gaza is 1-2 million people and has at points been in starvation to the point of infant mortality, but to label them as famine is against Israel apparently? Likewise, in Sudan 25 million people are being listed as in 'active starvation.' Is active starvation not a famine?

What's missing apparently is active data verification, and UN institutional 'green light.' If we can't prove someone is dying due to very specific criteria, then we don't label them as such, and definitely not if there isn't political will to do so.

This is bizarre to me, and the best sense I can make of it is that we have a conservative bias against declaring too many people dying? Someone must not want to hear about that, or want it said. God forbid we call out someone dying from food loss the wrong word, we have to be EXACT people! I find that utter bullshit – we should not allow millions to starve while quibbling over labels, and yet even cursory examination shows we do.

A responsible species should know if the amount of people dying from lack of food is increasing year of year. Not hungry or food insecure, but literally without enough food to maintain survival.

And yet we can't do this – does that ever nibble at you in the night?

Inflation has a strong role to play here, and it's interesting to me how persistent food inflation in particular has become. Many nations have at points seemed to be 'through' it, to the point some central banks are cutting rates, only for food to suddenly creep again a few points. It seems a dead issue to one nation and then you hear that in Turkey it's back up. No wait, it's been six months and it's down again!

Then why are cocoa prices worldwide still at all-time records? Why is gold above 3300/ounce (again a record)?

Crop Failures/prices/inflation

To my eyes today's inflation never really leaving looks a lot a system flickering and failing to return to normality. Inflation can't disappear because rather than societal causes alone, it's a reflection of physical realities affecting ever larger areas, and for longer. Market stresses beyond normal (often 30 or 40% yoy, or much more) show capacity fading and price being used to try to buy equilibrium.

I watch wheat and soybean and rice and corn production very closely, and in general they have been starkly 'stablish'. Stablish being big fluctuations in some places (China buying tons of soybeans one year, stocking up for a few, then buying little only to suddenly buy again. Likewise, rice shortages in Japan that cause the national stockpile to be opened, but availability to never drop at scale) but overall worldwide production has been mostly sufficient. What is interesting is that worldwide production isn't GROWING very much, and most acreage/yield numbers are going down, but not precipitously. In 2024 we did however have simultaneous breadbasket droughts in China, the US and Europe – something that's never occurred previously. A bad coincidence? I doubt it, but also not enough disruption yet to truly be a disaster.

So for the main food crops of the world we might not even label them as 'at risk/flickering', ie, nobody is even down 10 or 15% of capacity yet. There is going to be a shock to these crops soon sure, and we'll get into why, but it hasn't happened *quite* yet and won't in 2025. I'd call 2026 likely safeish as well.

See? We don't just focus on the negative. We're keeping our eyes on lots of systems, and using the stable ones to help us figure out the ones misbehaving.

Because while the 'primary crops' are doing ok, something *else* is happening elsewhere.

Cocoa, coffee, citrus, tea, potatoes, even beef and eggs and milk and butter have all experience >50% yoy rises at some point in international markets over the last 5 years. Some of these products have bounced back to 'normal' worldwide in that time, or at least regionally, and others have not. Coffee and cocoa in particular seem to be permanently elevated now, and we're on the fifth straight year of warnings of supply for both. This means not just that supply has tightened but that production is no longer sufficient for demand – or to put another way, they're in active collapse.

Salmon is much the same way, spotty production and some big fishery die offs, and given what we're seeing in algae blooms already I'd wager that within 2 years at

most there will be a mass poisoning as sicker and sicker fish are considered ‘ok’ to use. Because there’s nothing else.

BTW isn’t it interesting that if you were modelling the collapse of a food network, the first disruptions you’d likely see are to non-main crops, luxuries and crops grown only in small regions/etc, surging in price and availability at times, with some returning to baseline and others not? The only step after that is when the main crops go.

Depletion of nutrients in food

Measuring potential nutrient loss in our food supply over time is a fraught enterprise. Any gardener will tell you how unpredictable vegetables can be, and how different they can taste year to year. Factory plants are easier, but even then a small difference in varieties can lead to big confusion in nutrient measurement as different crops congregate different nutrients at different times dependent on different fertilizers. And as one good Indian study suggests (food/drop in nutritional quality in food) even the CO2 content of the air may be shifting how the same plant species perform in the same location.

We also have another study (biosphere/microplastics hinder photosynthesis) that suggest mircoplastics are altering plants too.

But what’s really interesting to me, is fusing the ideas! Think about it CO2 and microplastics are both going to be everywhere at the same time, and now they might both be shrinking and inhibiting plants?

Oh hey wait. Less nutritious + less yield = less ROI. It looks like we have decreasing EROI in another place!

There is a lot to go into with soil nutrient loss, and I feel one becomes lost in detail there quickly. I quite consider it sufficient to point out that (more plant production) = (more loss from the soil) = (compounding loss over time), especially in soil we remove more nutrients from than we add. We live on a finite earth and we do not generally feed our soil EXCEPT to feed our plants. Anyone who has tried to regrow trees knows this – the soil is absolutely bare to start.

Hell, even human graveyards (a traditional source of nutrients in the animal world) are made pristinely free of other life.

I do have at least one other good observation with soil nutrients though.

Nitrogen in solid state in the soil primarily comes from nitrogen fixation bacteria, and artificially from fertilizer. Luckily with soil there’s a unique opportunity to consider a pollutant almost entirely on its own. In ground or aquifer water, we have a chance to study a single pollutant as nitrates generally only have one cause at scale underground and that’s ammonia fertilizer.

So what do we see with our (for once) mostly isolated sampling?

The picture isn’t pretty, but as it turns out the majority of aquifers in the US have some level of nitrate penetration.

And wouldn't you know it? Nitrates are a poison, and a carcinogen, and many municipalities in the US don't screen for it, don't filter it, or don't update their testing procedures every few years. This means the area of contamination is growing of course, and concentrations generally rising. As an example Illinois has gone from an average of 3.25 mg/L in city drinking water to 4.5 mg/L inside of 14 years. This a level considered safe for drinking by the way, which is capped at < 10 mg/L. And despite some studies that suggest NO safe level of nitrate content, at least according to cancer mortality risks (HR: 1.61, 95% CI: 1.07–2.43 per 10-fold increase and HR: 1.61, 95% CI: 1.08–2.42 for detection) over just 13 years, 20 to 39 year olds (so, young!).

And we can't ever stop fertilizing can we? Not with tractor farming. So now most agricultural soil is receiving artificial feast-or-famine bursts that both transform the surface soil microbiome as well as introduce accumulating poison into the deeper ground water (and we're not even taking into account topsoil loss). And since we're on a finite planet, where does that lead? Some estimates are 40 – 60% of Chinese land is contaminated with fertilizer to the point of non-use. What do we think of this?

Is there a fast solution to the problem coming soon, or do we 'run out' of usable soil at some point? I make no claims as to 'when' here, but it's interesting to note that it's a conservative bias example – talked about lots but never assessed with full certainty.

<u>Obesity</u>

I mention obesity purely for one interesting detail –semaglutide. Here's the situation: Food calorie density increases > people end up fatter because calories are more common > fatness progresses until type 2 diabetes incidence rises >10% of the population reaches this state in the US > we introduce a designed medication for obesity (to fight it, not necessarily stop it everyone though)

We have invented a problem (artificial nutrient density) and then instead of altering that issue at scale, we have found an artificial mechanism to deal with it. Will this encourage more overeating do you think? Less pressure on companies and governments to address the food density changes? Will there be other side effects from the use of this medication, or will we simply dial the formula in until we reach perfection?

Given the sale of the drug we are clearly proceeding forward on a path apparently unafraid (at scale) of any consequences.

Professionally I know enough about our medications that there will be definite side effects for some people. I also bet these side effects will be LESS than diabetes. So it IS a good drug. But on a societal level, why trade one new unknown for another, when a solution like 'traditional foods' was a known quantity? It smacks of an assumption of safety to me, of 'the risk of 10% of a society on a drug' being assessed as inherently low.

Of bias.

On Cherry-picking

There's a lot of doom and gloom in this document and an immediate criticism I can see coming up is that I've 'selected' these crises. That the documents and the items we're talking about, and the way we're talking about them, might be intentional to create a dark picture.

Am I ignoring good events? Is sea ice expanding somewhere, or lots of places, and it's just this ONE study saying that it's falling?

I have two rebuttals to this – well, not rebuttals just gentle additions.

The first is please notice that in all instances we're using peer-reviewed sources, government information, firsthand accounts, etc. Whenever possible we're using multiple sources as well, so if there's data here you don't agree with, I would say you likely need to go 'further up the tree' so to speak, to find all the cherries. And given how many studies there are here, that's a whole of bias in the system already no? As we predicted.

But the second addition is even more a burden.

Let's imagine for a moment that you are right, and that I am picking the worst studies possible for this picture we're building. My response is….would that matter? Have you considered that if this is mostly bullshit, there is a LOT of bullshit? Or that all these studies likely can't be wrong? What if the AMOC really is down 20% (but no more), we're at 1.5C now (2025), and some slight amount of Antarctica subsea permafrost is firing, but everything else is purely wrong?

Those 3 things are just observations and well, aren't those 3 world-shattering events on their own? And what would their combination be? All the governments in the world could be headed toward peace and debt levels forgiven, but we've got no ice now. Likewise, the ice might be growing, but what if the micro plastic accumulations are still true?

On a systems level this is my response to any accusation of cherry-picking. I don't mean to, but if I am, it might not matter. If 80% of things are fine, I'm still showing 20% that aren't. And in a complex system like say the body it doesn't matter if the kidneys are regenerating, a new heart has been transplanted, and a pedicurist is on her way – not when the brain is dead.

And I've got plenty of studies and measurements pointing out there may be more than just a few disrupted readings.

If I'm picking cherries here, we need to account for why there are so many cherries, and what happens if just a few of them really are true. And please, go apply the heuristics for yourself and ask, do they fit? Does it explain?

The biosphere

We often hear the biosphere is often too depressing to look at sharply, which is of interest to me. Isn't that a general argument I have been making - we allow our biases to infect our reasoning to such a degree that there are subjects and thoughts we avoid?

(biosphere/etymologists thinking too conservatively)

This article is dear to my heart because it immediately illustrates my second principle so well – the etymologists first acknowledge that their estimates were far too conservative (1/2% loss per year initially, vs possibly 5% a year upon examination) as well as an acknowledgement of WHY it was so hard to see. They didn't want to. Repeated observations were hurting the scientists, their empathy, their very history. And yet I might assert that to love a thing, we have to get our hands dirty sometimes.

So, yes, human activity is killing most of the life on the planet and doing it faster than has been synthesized into a whole.

As an example, the WWF estimates 69% of animal life has vanished since 1970 (they use a compounded rate of loss, but it'll do for our purposes – and no one else has a better estimate, I've looked), with most of the loss 'back loaded' ie in the most recent years. Or to put another way, more of the population has disappeared recently in a description of exponential yet again. BTW, this figure is worse even than it seems. With animal populations constant loss isn't really possible. Instead for most species after a certain threshold of individuals are lost the entire clade will disappear. And as animals mostly live in regional clades, this means when the lions in Zambia get to a low enough population there are no more lions. And then the lion in South Africa can go through the same thing. So not a steady rate of loss, but a series of sharp steps down, one by one.

That will be the next 10 years, using the WWF number. 2% loss/year x 10 = well, not many lions left. And by around 2040 as well, a year we'll keep coming back to.

And worse, the population drops are showing up in protected preserves as much as the wild.

Even cultivated animal species keep crashing, and not just from pandemics. Bees particularly are crashing in multi-year patterns and in an interesting twist, *we still don't know why*. For a time, the suspect with bees was 'colony collapse' syndrome, an unknown effect taking out entire regional hives, and some work was done to try match the syndrome to parasites, infection, or neonicotinoids and glyphosate but at last we've moved onto admitting general ignorance. Tellingly attempts to isolate bee colonies, to remove toxic exposures, or to (like on kangaroo island) completely isolate bee populations have all failed to protect numbers. Almost everywhere bees are dying en masse, and many food industries cannot keep up their replacement. Bee rentals have exploded in price.

(BTW, if my characterization of the collapse of animal populations seems wrong to you, here's an exercise – please go find a populous animal or plant species that have maintained a growth surge worldwide in the last five years. I wasn't able to find any. Think about that. A whole planet, and while there are some regional surges, or 1 to 2 'explosive' years, the moment we look at the whole of a species across multiple regions I can't find anybody surging at scale. No niche winners, no new universal expansions, no foodweb role. Unfortunately, I think for any species to do a real expansion, it needs an ecosystem there and the truth is all major ecosystems are in decline now. We have no new winners because the general substrate of life itself is failing. But please, go look. And please, weigh how many examples you find versus the amount you find in decline.)

Avian flu

The current strain of influenza is unprecedented in scope, crossing the entire world, with animal's deaths estimated in the billions. Please do let that sink in – it's doubtful modern science has ever seen a pandemic of the severity of this 2+ year old illness and given our inability to assess let alone contain the pathogen (look at the milk and egg prices in the US throughout 2023 and beyond – same with beef and pork prices worldwide) in *cultivated* sources, I do not hold high hopes for even a COVID level of response should a human mutation occur.

Somehow in only 4 years (and with COVID still very much present) response capacity has degraded. International cooperation at scale on this crisis has been effectively nonexistent, perhaps not surprising for an animal crisis, but even internal operations for the disease haven't worked. At best domestic flocks are culled or isolated, and yet neighboring farms are left to test/inoculate/prepare entirely on their own. In the US meat production companies have had to take the lead in what should be a public health operation – an insane proposition, like individual hospitals trying to contain city-wide measles outbreaks.

I helped create COVID responses from month 1 of the last pandemic, pulling out dusty pandemic plans from previous decades, and my assessment of avian flu preparations is that we don't even hit that mark. Public health in the US is currently less informed, less organized, less cohesive and less interested than we were BEFORE a world-wide pandemic.

And that was before the FDA cuts of 2025. Avian flu had record spread in both chicken farms and cow herds throughout the first half of 2025, and yet still the cuts came. One hopes that there is a better plan than not worrying, and that the cuts don't effect pandemic preparation, but the heuristic tells me to doubt.

Biosphere theory in general

Finally on this topic, please don't be surprised by the mammoth drops in animal numbers we see in the datapoints or in my musings. Or in the talk of catastrophes beyond just the human world. It's not just the cutting of old growth forests (7% of earth's land surface left), or factory farming, or foie gras, or blinding pigs to breed more, that has defined the human treatment of animals, it's also our disdain for tracking their numbers. Or preserving specimens before a species goes extinct.

In point of fact out disdain of other life may just be part of human character. Another conservative bias we don't think about and don't imagine in ourselves.

If you've ever attended Australian school, you've likely learnt of Australia 40,000 years ago. Of kinds of animals and trees that haven't ever been seen in the modern world. Wombats the size of cars, 200 ft tall gum trees, vast temperate forests with birds bigger than humans - all burnt away by early humans. The taught curriculum is that these humans (not any other species, just humans) may have been fire-hunters, and somewhere in their history they let the practice get out of hand. The result was an entire continent scarred by flame and now missing most of its topsoil. A recently living land left dead and burnt and dried and just vanished into the wind.

There are some who dispute this version of events of course, and they could very well be right. More interesting to me though is that the story is passed around Australia still, implying some large amount of people that believe humanity capable of this sort of thing. Remember that with everything else we talk about; *it's possible we've done this before*.

And what I like about this story is that when I speak of it to non-Australians, most people generally accept it quickly. It's like talking about 2100 with folks. Why yes we might be in a lot of trouble by then, especially because there will be so much trash. Or because most of the animals might be dead. And of course the air will be worse, because we pollute too much.

These are all, maybe surprisingly, common beliefs. So there is the possibility in many humans that we ourselves could potentially be a problem someday, even if it's not now. Even if we don't all agree on climate change or populism, most folks do agree deforestation and chemical pollution are being caused by us. It's just rare that those things are a danger now. A worry certainly, but there's no talk of a new Australian outback tomorrow.

Which I kind of find to be…ass-backwards?

Think about it. Everyone accepts that humanity can be short-sighted monsters that ravage the planet – it seems to almost be accepted fact. It's just that that most folks (and governments today, as an example) assert the consequences for our actions can be unfurling right now. It takes time we say, or they aren't extinct yet (as if extinction debt doesn't exist). Yes the human race is short-sighted, but the Amazon still has time.

To which I say, but If you're short-sighted doesn't that mean you *don't* recognize when something is happening? Isn't that the definition of short-sighted, that you can't tell how far away a thing is?

Just something to consider.

Oceans

Unfortunately I have no real hope for sea life even beyond another decade or two, so I will generally leave it out of our considerations. We have studies showing that even plankton populations are in mammoth shifts right now, with 2% or more changes a year (what might be called a collapse might some). This is even more deeply disturbing when one considers that sea life is responsible for the majority of earth's oxygen, but that doesn't appear to be a problem on the same scale as others. I hope I'm not wrong on that.

The first immediate concern in the oceans is surface temperatures, especially figures appearing in 2023. In March of that year we saw a burst of heat that was quickly worldwide and wholly unprecedented as far as I can tell. By May of that year, .25C average anomalies had spread almost across the entire earth, with a few spots being much more. The nature of this heat has escaped any complete analysis in my estimation – not just why was it so hot, but why was it so widespread and synchronized? Hansen's explanations come closest with aerosols, and yet I cannot help but think his is still an insufficient model. Consider – the heat is EVERYWHERE in 2023, while the EEI shows up in the North Pacific yes, and even in the North Atlantic, and yet the whole planet's EEI doesn't change everywhere at once. Below 40S, in the southern hemisphere, there are very little aerosols and yet the heat shows up here too at about the same time.

When I try to imagine something that can heat all the world's oceans within a few months all I can imagine is the sun, and the ocean currents themselves. We did start entering the solar maximum phase in 2023, and it has been a prediction-defying strong maximum, but a .25C anomaly would be completely outside of any modelling, and doesn't pass a smell test. That much sunlight would be noticeable to your naked eye at the scale necessary. So yes the maximum could be a (small) component, but not the bulk. So – ocean currents? Is that possible? Could a nearly worldwide shift have occurred in ocean behavior in the first part of 2023? This explanation fails for me too – as much as the oceans are all connected, and the sea anomaly shows up in Antarctica waters (all time ocean high for March reached in 2023 off Elephant Island) the same time as the North Pacific, sea currents aren't suspected to be that uniform or that connected. Unless of course we don't understand mixing (or heck, even ocean currents) as much as we think?

Or what if 2023 wasn't one cause? What if what we saw starting in the oceans wasn't a systems change, or rather just the system *changing*? What looks like a 'jump in 2023' isn't a jump at all, but a system threshold, with normal activity giving way to new momentum? It is Hansen's aerosols there yes, and that's a jump, but rather than one large single jump, the increases could be the unmasking of aerosols combined with weakening currents combined with EEI mismeasurement combined with marine heatwaves that have been spreading heat much further and much longer than we were thinking at the time. And what if instead of 'seeing' a sudden change in the ocean SST in 2023, we noticed that the deep oceans had been changing in 2009, and the arctic ice changing in 2000, and the EEI changing in

2006. And wouldn't you know it, the trajectory of each of these is up, and has been for decades, and we simply need to learn to layer them together.

In this picture of 2023, ENSO and tonga and SO2 removal all hit at around the same times, and any resulting sum of heat overwhelms natural variability. In this picture SO2 probably did show up in 2021/22, but it wasn't enough yet to overcome 'normal' behavior. But then when other forcings are added to it, we get a 'leap'. In this (purely theoretical) situation, we do get another interesting possibility btw – what if naturally 'cool' periods right now have a strong heat forcing under them, and so only appear stable? And hot periods? That's just neutral periods + forcing. Maybe we're not having a 'hot' event at all, just so much distributed heating that everything now looks hot.

Regional oceans have some strange readings along these lines. In 2024 we saw surface temperatures in the Atlantic hurricane MDR reach quite unprecedented levels. But unsurprisingly some of the fastest accelerated hurricanes ever resulted, and quite 'ahead of schedule.' And with huge damage totals.

In 2024 and 2025 we also saw ocean heatwaves combining with drought on land to create the Kangaroo Island algae blooms that continues to kill so much sea life around South Australia.

With events like this ongoing, I think it's safe to say that sea temps alone will be able to give us on land a number of 'black swan' events, and that's before typical Earth numbers melt away into our next 'other world' state.

On Earth, back in the Jurassic and Cretaceous there were several large storm events that killed many migrating hadrosaurs. Hurricanes large enough to leave fossilized sand waves at the bottom of the ocean and hail stones weighty enough to crack open a triceratops' rather thick skull all occurred. Presumably Earth's gravity conditions were the same then, so the only major drivers were talking about would be heat and atmosphere differences, and we're heading in that vector now. It makes me wonder at what point is having an extra 1.3w/m2 going directly into sea water going to have effects we did not anticipate? How long is the road from the modern world back to that one? Is there a reason to assume it's far away? I like these questions because it helps us ask, when should we use the precautionary principle? The Jurassic is VERY far away from today, and yet is it so far away we should forget that it was the same planet?

One dynamic that is crazy hard to model: the absorptive balance between the air and the ocean. In 2023 when the oceans jumped .25C, the air temps did not jump nearly as much (proportionately to heating potential that is). Yes 2024 was the hottest year on the surface, but it wasn't even close to how much hotter the oceans remained. I have several studies on ocean inertia waiting for that you that describe the possibility that more energy is making its way into the oceans now than usual, something like 91% bypassing the air instead of a more typical 89%. That shift of 2% is mammoth, and also not particularly well understood. When did this shift happen precisely? What is the dynamic behind it? Will it increase further? Or will it possibly decrease, in which case air could leap even more than .25C given the difference in each medium. Whatever these mechanisms are at play here feel a lot

like ‘jostling about’ to me, an interplay of liquid physics dynamics that mean different minute threshholds of energy transfer cause big shifts. Like increases in saltiness changing electrical potential. I do not know this is the case, but I also don’t think we should trust this ratio as being stable – we don’t know the cause and the dynamics at play might be wickedly complicated, shifting from resistant to conductive back and forth or getting more extreme. And hey, they *just* changed on us right? Why not more?

Hydrates + subsea permafrost + pluming

You’ll have noticed by now I don’t use a lot of numbers in this document (at least not compared to institutional pieces), and a lot of loose descriptors like ‘larger’, ‘faster’, ‘worse’. This is, believe it or not, intentional. This whole document is about how there might be more errors out there than we think, and a good place for errors to hide is numbers (‘safe’ levels of nitrates, EEI measurement, aerosol forcing, the year something ‘is supposed to’ happen). So I like to stay away from solid figures and even when I give you numbers, know I hold them ‘lightly’. IE, I expect any number I use to be wrong. This is why I like simple words like smaller, or slower, or more. Words like this describe *relationships* between two things, and I like knowing that space between them a lot more than I like pretending I know precisely the position of both items. Why do I mention this? Well at one point I considered rating the dangers we face (the size of our potential errors), before I realized how silly that is. I could list micro plastics as the 15th least likely danger I talk about (it’s not) and they could STILL kill us, yes?

With all that being said, here’s a danger that’s very large. And of course we rated it as very unlikely.

And a warming, trying to research methane hydrates/subsea permafrost/and the possibility of their status change is simply maddening in the current world. Let me demonstrate why:

No one studies methane hydrates at depth, over time, in situ. What few studies have been done concerning them seem to use laboratory conditions, how much direct air heat it takes to disassociate a hydrate, or consist of theoretical dynamics studies of Saturn’s moon Titan. No one can say exactly how a hydrate works here on Earth because of how varied their presentation, and every time a theorist begins to work on them the same refrains come up. But hydrates are at PRESSURE, is the call! And pressure will protect them!

And yet one can never find submarine data down there to match conditions either…

It is much worse than this though.

Sometime in 2013, while trying to understand dynamics at Earth’s poles, I came across Shakhova’s 2010 interview about the possibility of 50Gt methane releases from subsea permafrost in the East Siberian Artic Shelf. Curious, I looked her up, learnt about the Siberian Traps and about how few expeditions there were to that area, and how this scientist performed studies there on site, on the water, for months, gathering datasets that are still used often elsewhere. I even learnt that

her team filmed some of the plumes that had begun to appear throughout the region.

And then I immediately discovered that this scientist's warnings were…somehow controversial? Dismissed? That nothing had come from that interview by an at least still referenced scientist working with direct observations? I had immediate thoughts. If this person (who I don't know, maybe she's awful) is untrustworthy, why is her data being used? If she's wrong, where are the other measurements or experts from that same regional area of study to refute her? Wait…there AREN'T any other scientists who go to the ESAS and look? She's it, she (and her team of course) are *the* experts? So why is that interview discounted? Who else is doing observations in that spot?

It's even more maddening when one discovers a paleo record that quite supports her claims, namely that the Siberian traps and the artic shelf offshore have been putting out a lightshow of concentrated methane and hydrocarbons since before the Triassic. Perhaps this won't shock you, but that very region is in fact the single LARGEST, CONFIRMED region for methane build up on the planet – riddled with hundred-kilometer-long rock formations that descend into shallow water, that are often capped by ice, and where deep lava tubes can bring pyrogenic methane upwards to form giant pockets. This region is a likely source of the P/T extinction event even, responsible for an interplay of volcanism, coal and methane that reshaped the entire planet at least once before.

And so here we have a scientist with repeated direct observation of a zone, who's data is still in use, but who's conclusions are suspect because…why? Why is a 50Gt release so suspect?

The artic was changing even before 2010, and the years after have only made it more obvious.

We have lost Marc Cornellisen, Phillip de Roo, and Konrad Steffen to a changing artic. These were experienced scientists literally studying thinning ice and cryosphere changes, trying to identify and predict a problem, going on site to measure significance, and then losing their lives. That's actual death right there, so why is it still so hard to imagine a world changing? Or that this changes might be… significant in nature? How easy is it to stay in a nice office, or a warm living room, and deny the hard work of scientists locked in ships or camping on ice?

But we're still not done here, and it gets worse. Because in 2025 we still have a war with Russia ongoing, and thus an isolation of data. And so as of this date, Shakhova and her team's last observations remain the MOST RECENT expedition to the entire ESAS. And likely will be the same for the expected future. Dismissal of Shakhova *now* smacks of short term thinking and simple stupidity. Especially when artic plumes continue to grow and now show up in Antarctica waters as well.

Atmosphere flux readings from Canada and Greenland and the Nordic countries are all mostly stable (though elevated), and yet I am not comforted being blind in Russia. Methane sources of some kind are firing at both poles, and now we can only realistically quibble over the magnitude, or source, and not whether are even happening or growing in size (they are). And all that methane must go somewhere,

no? Given Shakhova told the possible upper end of where this could go and the fuse is ALREADY lit, I would say we pay attention.

Quick math from Shakhova is 50Gt from the Artic. The Spanish expedition has said 24Gt from their site in Antarctica. Should either reservoir turn over fast (like the methane sinkholes showing up in land permafrost), they could quickly double current global warming. Will they? I don't know, but we had a warning about this.

And btw, these sources are not planetary methane hydrates either, but merely (likely) shallow water subsea permafrost deposits at the poles.

Planetary methane sources are a lot worse.

If Artic methane is almost always shallow, and Antarctica mostly shallow, the rest of the earth's hydrates are generally deep water. >500m depth has always been the koan repeated, and they are stable due to ocean water that takes decades to shift (if at all) and massive pressure. And so with these firm forces in place, even today clathrate gun theories are solidly in the realm of conspiracy theorists and Guy McPherson. It doesn't matter how many plumes there are at the poles, and it doesn't matter if surface waters have jumped more than modelled, general discourse treats methane hydrates as a doomsday scenario of paranoid.

Well, they are at least very much doomsday, so let's get into it and see.

(oceans/bottom marine heatwaves, gas seeps and hydrates, bottom marine shelf heatwaves – <u>do please notice all 3 studies have different authors, and from different institutions. We're not using any one or even two data points here, we're going broad</u>)

The first correction we need to make is that deep oceans are likely neither static nor insulated. Not only do we have diverse evidence of ocean heatwaves at shelf or 'shallow' depths such as 250m, but also of bottom heatwaves at depths of a kilometer down. It appears that marine water columns shift more than assumed, and that at least some currents transfer heat faster than initially thought. Neither are such events short, and several degree C increases have been observed lasting several months in a repeated behavior. This length is especially relevant as often hydrate stability is defined in terms of something like resistant to heat for xx amount of time. Well we can move past such metrics already, and now we simply need to assess how deep and how long for each deposit.

Worrisomely surface warming doesn't reflect deep warming either, so we can completely not know when a bottom heatwave is taking place. We appear to have been missing them for decades even. In retrospect analysis 2 general ocean-wide system shifts seem to show up for heatwaves, one in 2009, and another (larger) in 2019. With these we now have evidence of hydrate stability zones dropping something like >50m/year on shelf hydrates. This won't be full unwinding yet certainly, but nonetheless these are zone of potential activity that will migrate toward movement/instability in the 'near' future. Deeper hydrates are supposedly more safe, but I find this repeated claim insufficient for confidence – my true guess is we simply are not looking at scale, and so ARE GUESSING WE'RE SAFE.

Unfortunately both shelf and general bottom heating are likely to be accelerating processes right along with all our other heat events, and will rise even faster with localized events (like heatwaves). In practice what this means is that there is the possibility of a 'lens' effect over a previously stable hydrate zone, creating the potential for extreme and sudden destabilization from concentrated forcing.

There's a natural inclination to try to match methane hydrates to subsea permafrost, but I advise not to do it. In permafrost the methane is generally thought to have had less time to accumulate, and is under a lot less pressure. And btw the lensing potential over permafrost is probably even greater, with Artic/Antarctica amplification putting the shallow water under a magnifying glass (another unanticipated reality that appears to suggest Shakhova's theory of release is even MORE likely).

How do we know hydrates aren't firing at scale now?

Currently the general physical theory is that should large amount of hydrates be firing at any time, we'd see the evidence in a burst of atmospheric methane. And indeed on one hand the atmospheric methane does appear to be growing. But on the scale of planetary methane releases? No. I'm not seeing it. What's more worrisome though are theories that methane released deep enough down in the ocean NEVER make it to the surface, as ocean dynamics and biological reaction reduce the releases down to chemical components. But what's the upper limit to this? Is there an amount of methane that could be released constantly and not appear anywhere in surface/air readings? Could a small leak be happening almost everywhere, and not show up unless you look for it? I'm not sure. It seems unlikely, but that's the bias talking.

Instead let's make a few observations, and work this through on a system level. First we should acknowledge that we don't look at the oceans enough. We don't actually go down there that is, let alone down there all over the place. Also, unfortunately, hydrates appear to be almost everywhere. Not just in the ocean's deepest depths, but right under the ocean floor in lots of other places, and how large might those deposits be? Well they're buried in the ground, underneath the sea so…we don't know. And given the size of the oceans, hydrates right now could easily lose something like .005% a year worldwide, have it be turned quickly into CO2, and we wouldn't be the wiser. Just another layer of our 'stacked' 2023 forcings for example. But IS that happening? And could worse releases actually be happening and being missed to?

Here's where we humans come into play, in my thinking. Let's list some things we've been wrong about: we thought the oceans didn't heat up at depth, we thought it took a long time for them to heat up, and we thought any changes were well into our future. So when we look at that track record…suddenly 'pressure will always keep hydrates safe' seems a very thin last hope to me. So my thought here on hydrate destabilization is a very firm 'we don't fucking know.' Large scale destabilization could be close, far away, never at all, or already happening.

But here's the clincher to me – what would it look like right *before* deep sea hydrates somewhere started to destabilize at scale? We already said that small loss

might be invisible, but surely before the deep sea goes some other deposits would? Well here we end up at subsea permafrost again, but that would likely fire first right? And not just a little, but big seeps, showing up more and more, hundreds of kilometers wide? Well that's happening now.

And we'd also expect some marine heatwaves yes? Heat of a few C at least, for months at a time, sitting on top of the hydrates? Hmmm, that's happening too isn't? At least in some places.

Is there anything else? Any other warning signs we'd get? Maybe weakened or changing ocean currents? Well don't worry, we've got those too.

All of this is happening *right now*. Do you start to see the problem with confidently asserting that 10,000Gt of CO2 equivalent of methane hydrates are all completely fine?

Ocean acidification

(ocean/Ocean_PH_graph)

It amuses me to no end that the appearance of ocean acidification matches so closely to atmospheric CO2. It makes sense!

So of course there's probably more to it.

For whatever reason when I think about acids in the ocean, I begin to wonder about methane hydrate biodigestion. Follow me for a moment - Everyone says the methane from the hydrates gets eaten by the critters, and we don't need to worry about right? The methane gets spread through the column, eaten or reduced into carbon, and the carbon will...go into the water? How is carbon in water exactly not what is happening with ocean acidification? Are we sure we know where all the acid in sea water is coming from?

At this point in the document you're probably not surprised to learn that ocean acidification is the sort of problem that has been identified as potentially catastrophic and even labelled as a 'planetary boundary' by the Potsdam Institute. Luckily, at the beginning of 2025 they were quite sure that this boundary was at risk. But then of course I've now seen a study suggesting we might have passed that same 'safe' boundary condition five years ago, at least within >60% of ocean layers and zones. I'm not going to say one study proves Potsdam was in error, and in fairness mixing environments can be wickedly complicated to reduce, but wouldn't it be ironic if another boundary was actually LONG past?

This really is a worrisome thing we should be tracking by the way. Results of such a passing (as measured by seawater with aragonite saturation state > 20% reduction) would mean the nonstop decline of calcium carbonate organisms – no need to wait until 2060 when it was previously predicted to finally hit the majority of the oceans.

As an aside, if confirmed this regime shift would actually make it 7/9 boundaries now 'passed' in the Potsdam Institute/etc global health check. My confidence in predicting coral functional extinction by 2030 grows.

Ocean ‘unknowns’

I have suspicions of forces at play in ocean dynamics that I have yet to see either good observation or theory one. One example is micro plastic pollution building and suspending in water columns – link microscopic layered trash, suspended at varying heights due to water density, forming layers and trapping heat/water/other matter above or below the ‘settled’ layers. Carbon or some pollutants might do this too, and I haven’t seen much information on a greenhouse effect in the oceans themselves. Seems a pity, given how big they are. Pollutants on the floor bed are (a bit) more studied, but how do they interact with methane hydrates I wonder? Could plastic or chemicals be abrading surfaces over time? Or strengthening those marine heatwaves? If so the effect will be everywhere, so even a subtle value might compound.

Similarly I wonder about hydrate fractionalization – we know now that warm waters are bathing hydrates at scale all over the planet, does this cause some amount of evaporation? Even if we think we’re far away from a heatwave breaking apart a deposit, I’d imagine there is some potential for ‘loss’ of some kind from surface exposure, especially with repeat events. How much? Does it matter? No idea, but we’re trusting on that sort of thing to be small and insignificant now.

Final comments on Ocean

I have gone looking for marine data, and it is hard to find. Authentically looking at the size of research on ocean matters versus the size of research on everything on land, and you quickly tell just how little we care about the waters. It’s obvious, we’re land based, right? But it’s just not true. We might be based on land, but the oceans are air, transport, food, and heat and humidity. They are the walls of our cradle, and it is a bad sign to me when data is regional or satellite at best, and deep water and bottom studies are as rare as they are. There is simply a lack of interest in the oceans, and an assumption that whatever is there can’t matter. Does this sound like a reasonable situation to you? The kind of scenario that should exist if we responsible, attentive members of the Earth system?

And if the situation was bad before, the defunding governments have gone through in the 2010s has only ramped up into the mid-2020s. At a time when the oceans are observationally changing the most and the fastest ever, we are cutting out more of our eyes. Why? I find this bizarre – the oceans are the most alien places we can access on earth and alien things can hurt us. And instead we are ignoring them and finding ourselves confused with how they behave.

An application of the heuristic

I didn't come up with the heuristic to share with you. Or rather, I've had the heuristic for years, I just didn't think to share or formalize it until I started to understand the real scale of the problem. Like you, at first I just found that it explained a few things here and there. Stupidly, I never took it further than that.

I can literally demonstrate this stupidity of mine to you.

(Atmosphere/ 23 whiteboard.jpeg)

This whiteboard was begun and finished in a single afternoon sometime in May or June of 2023. At the time I had been observing daily SST and surface temp anomalies with an eye for signs of flickering or regime shifts in earth's systems. It's the same way I go through papers in the morning, or NOAA datasets, or bluesky accounts of the smartest researchers. We're changing a big system here, and it was as clear then as it is now that changes are coming, I just didn't know what or when. My first stupidity was imagining that the changes were still mostly ahead of us then, and not realizing how many signs were already firing elsewhere. I thought *these* signs are the ones that mattered, and so when March 23 rolled around, and the April, and then May, and all were all-time-highs, I thought I had a good idea of what was happening.

To explain the situation to my husband (who wasn't as interested in climate dynamics as me) I sketched out what you see above as we sat and talked about what was happening. Then, because it had become a good conversation by the time the situation was 'described', I thought hell why don't we look into the future some? Create a prediction for the next while, so that we can assess if we understood what we were seeing.

So we did. We listed the dynamics we thought were at play and then left the whiteboard alone so we could refer back to it and see how we did.

To us at that time, what was happening both in the world and on the board wasn't particularly a mystery. Yes of course we knew that the atmospheric and ocean systems of Earth couldn't be reduced to exact figures, but I was confident that the largest forces at play could be largely accounted for, and besides, this was mostly a game. Earth is changing, can we guess what happens next?

After our talk I left the board alone for at least the next year. I did refer to it sometimes as we talked over one subject or the next, but honestly I really just ignored it. I assumed that the assumptions written down were obvious, and that other much smarter climatologists and physicists and grad students were thinking much the same thing as we did that day. What we were doing was fun, and not special.

I still maintain we weren't doing anything special that day, but I think I might have been stupid a second time when I assumed others were doing work like this. Don't get me wrong, I KNOW other folks have done much deeper, more intricate, more precise calculations on 2023, modelling, heating, etc.

It’s just…I don’t know if any of them were correcting for bias? And we did.

What was on the whiteboard only slowly came into my vision again as 2024 rolled on and I kept encountering stories about unexplained ocean heat that I started to realize maybe not everyone did understand? The Goddard Institute very vocally admitted they couldn’t explain the heat that year, and by 2025, as I was reading the first of James Hansen’s papers (Global Warming Has Accelerated) I began to realize something was wrong. 2023 had never been a mystery to me.

But was it possible that it was to other folks?

I revisited our whiteboard then and had a dark afternoon of revelation. Somehow or another, the sloppy, bad math predictions listed on that dollar-store whiteboard had beaten every other major prediction or explanation I had read up to that point. You never just stop and look at your own work right? And this…this was just nothing. A fun conversation.

So what was going on?

Please understand that even now, I’m a no one. I have no advanced degrees or even university training in physics or climatology. Or mathematics. I was just having a fun talk with my husband.

Am I crazy?

Why don’t we investigate together, and we’ll see if we can spot the ONLY thing the whiteboard did that no one else at the time was doing:

In case you very understandably can’t read the board, I’ll walk you through it.

The first ‘row’ of the image is a simple list of when atmospheric surface temps first hit the 12 month avg of 1C (2015), 1.5C-1.6C (a prediction at that time) (2023), and 2C (2026/2027 – again my prediction). I also listed that Hansen’s Global Warming in the Pipeline paper had predicted 2C by 2040, a number I disagreed with (we’ll see why).

Between these dates/temperature numbers I listed the years it took to reach each point, 7 years between 2015 to 2023 and the 3.5 years I predicted would occur for the next similar rise, 2023 and 2026/2027.

I also listed the EEI of 2016 (1.5w/m2) and an estimate of EEI for 2023 of 3w/m2 (or between 2 and 4). I noted that an estimate of 3w/m2 would be approximately double the EEI of 2016.

To further drill down on my predictions for air temps in 2023 I listed out some of the major forcings that were also ‘different’ from previous years. These are the confounding forces that would be making up the possible range of 2-4 w/m2.

Here I listed:

Tonga blast of 22 (likely cooling, but not certain)

The SO2 fuel reductions of 2020 – 2022 (ie, the 22 months it likely takes for sulfates to clear), estimated to be +.5 to +1 w/m2 on its own

The upcoming 2024 solar maximum

And an upcoming el nino, that was not particularly strong at that point (or indeed forecast to be)

I then noted that CMIP6 (which I misspelled) models had been running hot for some time, showing an increased ECS level that was dismissed. I asserted that these same were instead correct (and they are) and the entire earth had been discounted. In my eyes this meant that the EEI was being calculated inaccurately, as ECS was higher.

And last I listed 2 other groupings – on the left side and in the middle I put under 'yet to fire?': subsea permafrost, BOE (blue ocean event), clouds and aerosols. The question mark was meant to indicate that the IPCC had determined none of these had yet happened at scale. I believed differently. Why?

Well we can get into the specific thought process in a moment, but the core reason was simply, *I was already using the heuristic*. When James Hansen made his predictions in Pipeline, I knew he would only use data he found defensible. Just like the IPCC does, no climate scientist 'goes out on a limb' and considers work that isn't well defined yet. Everyone sticks towards what is firm, defined, peer-reviewed, etc. And at first this seems like a good idea right?

But is the world peer-reviewed? Haven't we already talked about studies that aren't done, and places that we don't go? Do we really think everything that could affect our math is already accounted for? Hell even the IPCC has known unknowns and unknown unknowns they just don't account for them.

Well on the whiteboard I decided to include the unknown. Here's what I thought:

Seeing Shakhova's report from 2010 and the increasing accounts of artic plumes throughout 2021 and 2022 had convinced me that it was likely methane release had already accelerated to a scale that it might start effecting air temperatures. Likewise BOE is a misnomer to me – the more artic ice we lose, the more 'BOE' we get already. We don't literally need 'all' ice gone for the water to catch more light; 90% of ice gone means we're at 90% of BOE each time it occurs. Meanwhile clouds have never been factored properly, and the more anyone tried the more models began to run 'hot' (see the CMIP comment), so clearly cloud feedbacks had been occurring for some time. And finally aerosols have never really been accounted for properly, and look how big SO2 was turning out to be! So what other exotic particles were there in the air, doing things we didn't know? Those compounds released and never detected or reported, or else leaked by companies who never admit to what they did?

In my mind all these factors would be at play, and rather than discount them, I would factor them in. And how do we do this? We round up, we assume the worst, we anticipate error.

We correct for bias.

If James Hansen gives a range, I'm going to use the upper end of that range. That mean the full forcing of SO2 reductions was likely going to be 1w/m2. And since the

heat was sudden, I didn't think it had all arrived yet. So .5w/m2 was coming I thought, and that was just SO2. What about the unknown forcings? Surely they were small? But no, that's hopeful thinking. I knew no one was looking at them closely, so let's assumed big. I gave these a value of 1w/m2 on their own.

So if we were at 1.5w/m2 in 2015, I calculated 2023 would be 1.5 + .5 + 1 = 3w/m2. A doubling of heat forcing from 7 years prior. And since we had just hit 1.5w/m2 in 2015 and 1C, I decided we'd do at minimum the same now, so 2x acceleration means ½ the time for the next .5C rise, 1.5C would be 3.5 years or 2023. This was terrible math then, and terrible math now, and I know it.

This was epitome of napkin math. Of 'putting in best numbers' knowing full well that it wouldn't be purely accurate but wanting an answer anyway. But it did do *one* thing I haven't seen anyone else do.

It assumed a worst case scenario. It corrected for bias. It added a number to say, let's account for the bad things that we're not accounting for elsewhere. I literally remembering saying at the time, well what if it's worse than we think?

By that point we'd almost run out of whiteboard, but since we were on a roll, I decided to go with the idea. What if 2023 was as bad as possible?

So at the bottom, below the line, I made a more specific prediction.

The first 1.5c day had appeared in 2015. And the growth towards 2023 had been nonlinear, with 1.5C days appearing much more often in 2022 and 2023 than in the years previously. So I estimated that 2C was going to show up in 2023 too, and it would reach that point likely 2x. I also estimated that at least ½ the days in 2023 would be above 1.5C average. Why? Because not only was the forcing 2x as strong as it had been, but it had arrived sooner. So we should reflect that in some way in our predictions. The system was behaving nonlinearly, so we need to account for this.

Finally I reiterated 2 pathways that I saw for 2C itself (now that 1.5C had been reached and we wouldn't be going back for long) – either appearing in 2027/2028 or that a real feedback would fire and give us another 'boost' like 2023, leaving us with 2C in 2024.

Looking back on this board even now it amazes me – only that last prediction wasn't at least partially accurate.

Why? Why did the shit math here work so well? Was it random chance?

I don't think so. Yes I have no training and yes my math is very sloppy (and poorly written).

But I was already using our heuristic then, and you can see it. Question everything, assume people are putting the answer where they want (Hansen and his range), and look up (consider other factors from other disciplines, like methane seeps building up or the loss of Earth's albedo).

And don’t worry – this whole paper isn’t based on using this one image. We’ll make more predictions in a bit and you’ll be able to grade them in real time to see if the heuristic really does work.

But this also did happen, and for a long time I resisted seeing why.

Just correct for bias.

Air temperature

Air temperature is a fickle beast but (obviously – see the previous section) it can be partially tamed. The last question I really have on the subject is can humans be likewise tamed?

Air temperatures are going to rise most years now, and in general they will rise more than we previously thought likely. There will be blips and bursts for sure, even some small periods of cooling yet, but this is only because our system is flickering. I'm confident that when just the feedbacks we've about so far escalate enough, that then we'll never have a year cooler than a previous one ever again.

We might already be there.

And even though we're going to blaze past them, let's also quickly talk 1.5C and 2C.

These are of course the dreaded metrics favored by the IPCC and governments worldwide, but did you know there isn't a single value for these? Surprisingly even the IPCC likes to us different data sets to plug into their base formula for these definitions and so some pretty different values can result. And worse still, even though the numbers show up faster than expected now, we're not updating our metrics.

The avg 12-month surface temp value was 1.64C for a while in 2024. The 24 month running mean got above 1.5C. 2C was reached on many individual days.

I like to note these events because it very quickly becomes apparent that these 'values' mean vanishingly little. They are arbitrary and chosen for someone's convenience and then never moved again, and on top of that only the IPCC can 'declare' when they are met. That makes these concepts almost dogma at some point, where we can argue over them infinitely and no one can say when we hit the dangerous moment.

How is that not perfect for our overall conversation?

Normalcy bias

What is this document about? What is its goal?

I seem to talk about collapse an awful lot, so this document must be about a meta-crisis of complex cascades yes? But I did give the heuristic and state that the core difficulty the human race faces is a bias no? Sure it's been applied to the world for a while, but the reason we have problems in the first place is the existence of this bias. Maybe if we could just correct for this bias, we'd all be ok? Is that right?

Let's unravel here a bit.

The truth is that I've used the heuristic myself for many years. I informally adopted it as a way of understanding the world around me, of matching a correction to the interpretations of data I received from others. It's just that during the application of this heuristic, a problem began appearing and in multiple different places.

The problem is a convergence of 'chaos' loosely around the span of 2030 to 2050.

This of course is the same timeframe that Limits to Growth was concerned with, and wasn't that odd? The same trendlines, the same years, appearing over and over and right alongside what a 1970s paper predicted.

As it turns out using the heuristic I accidentally *found* the collapse, and after that it's been hard to pay much attention to anything else – I mean what's the point?

And so this document, this little scream out into the void to try and let other people know what's about to happen. But maybe it would help if for a bit we went back to just the bias itself? Sure, of course.

As I hope I can show you, the bias has had many other consequences too, and most are far from deadly. You should go looking for them if/when the priority period has passed.

In fact, if you ever have the time, you should probably try to quantify this bias a bit better than I have. I'm most concerned with finding the best corrections for it, but I bet we could do even better if we figured out, for example, if this bias is mostly avoidant or attractive? Or is it a normalcy bias instead? Or are they separate things? And is this a biological and structural consequence from our brains, just some bit of physical anatomy, or is somehow memetic in nature? I have actually have lots of thoughts on this, but I think it's best to leave to you to ponder.

Still, here are some potential examples of the bias in the 'non-catastrophic' sense to get you going:

-Have you noticed the rise of corporate risk aversion practices? IE, companies defaulting toward 'tried and true' rather than experimentation? There have been over 40+ Marvel cinema/television projects and yet general review trends for theatre pictures have been dropping in the same period of time. We're told the companies don't want to risk money on original stories, yet will spend 300 million on a CGI picture when the Blair Witch was made for 1 million and produced 9600%

returns. So why large tentpoles? Wouldn't 300 attempts at a new Blair Witch be more profitable?

-Cars today are so…round. And similar in appearance? Why is this? Ever see a car from 1950? They were similar to each other than too, but they shifted mammothly in design every few years, and a lot of the designs were quite flashy. Now 2010 looks a lot like 2025. Is this normalcy as a product for your enjoyment, or for the companies that make produce? Why take less risks on something that could inspire strong affection?

-One of my favorite book series was Redwall. Lord of the Rings isn't bad either. But of course at some point we have to notice that there are no good orcs? Why are rats, stoats, weasels, so laughably universally evil that before you know it, each book reads a lot like an ongoing genocide? And for that matter what does a German 1940s Nazi actually look like? Do you know? Because Captain America sure punches and kills a lot of them, and they're all evil as can be, but that's…that's not earth? Why do we default to an easy simple picture, with clear good and evil when evil and good aren't physical definable things? Is it because…we like to? Do we want reality to be simple? And are there consequences to that want?

-Dragon Age 4 came out and was a disastrous loss of money, and entirely because a world that was once complex and nuanced was replaced with a live service formula. This keeps happening. Minecraft is originally made by 1 dude, makes billions. 2 billion (or something similar) is poured into Anthem and no one can find anything to like about it, because there's nothing to like. No 'content,' just a sea of safe decisions. Likewise file sizes of video games are up 100x (or more) from 1990 to 2015 and yet typical game length is the same? The graphics have increased in complexity, most definitely, but there hasn't been a 100x expansion in story or experience? BG3, war of the righteous and planescape:torment are all games with 2 million+ lines of text, often 400 hours or more per play through, and wildly popular, and yet most gaming executives aim for mobile games or 'shorter' experiences. Is this for the audience, or for them? Why do this to the market, and to your own reputation?

-Ever been sick? How many doctors have you been passed around between? Who, in particular, is in charge of that situation? Your GP? Then why are your visits with him 8 minutes long? Do 8 minute visits every few weeks fit a realistic pattern of being able to cross synthesize a multi-domain picture? Doesn't this seem to… discourage a cohesive picture of a person's health? So why optimize for 8 minutes? Not for you of course. Why can this be noticed, mapped out in detail, and yet not changed? Whose normalcy are we building?

-Did you know Honda is the bestselling motorbike on *every* continent. Does this seem sensible? In nature we tend to get high variation in different settings, ie adaptation to each situation. Sure we're manufacturing bikes and not children, but shouldn't there be local manufacturers able to adapt to local circumstances better? No wait, we adapted the local culture to match the manufacturer didn't we? We optimized for a corporate process rather than a national, regional, or even local process. Did anyone have a plan for this at any point, or are we just winging? Tribes and families often have goals and plans (Jack London built his family home

with the explicit desire it would stand 1000 years, and it's a lovely ruin), but corporate plans seem very…short sighted in comparison. Quarterly.

-Why did the gay rights movement embrace marriage and surrogacy/adoption? At times in the 1960s and 70s there were specific trends that suggested polyamory, nonstandard family arrangements, or entirely new queer lifestyles. Radical fairies, leather pride, two-spirit, cis-het rejection were all suggested but by today have generally been sidelined or even made (nearly) extinct. Pride events now often ban 'suggestive' outfits or expressions of overt sexuality. Gay is being normalized, and while legal recognition provides societal benefits, is the overall trajectory of this turn towards 'a baseline' reflective of our roots in riots and Act Up? Should queer resistance have joined mainstream? Why was there an impulse to do so at all? Must everything fit into markets, demographics and easy explanations?

Also as a refutation to some of what you're thinking - please don't think I believe *everything* is crumbling. That's ridiculous. Rates are what matters. There are many subjects I don't touch on here because there's no reason to talk about them. Rare earth metals as a whole are never running out in our lifetimes for example (we don't have enough production for a green transition by a factor of at least 10, but we could continue business as usual for many more years if it weren't for other problems). Neither do I talk about hydrogen sulfide, imperialism or how we treat workers. Or why streaming sucks now. I've prioritized, and these are just the catastrophes.

Plastic

I’m not sure there’s a better example of compounding conservative bias than plastic. The very nature of its introduction, a fantastic space-age product that can do anything and lasts, easy to make, cheap, colorful, these are all traits that immediately should make one ask…well, great but then what? What happens to a product that doesn’t degrade and yet is disposable? To an item that replaces every other material, even down to ours clothes, and yet won’t biodegrade? How does something like that NOT build up into giant piles of waste?

And then of course we discovered the fragmentation feedback loop.

Whenever a piece of plastic snaps apart, the more the surface area for that original piece of plastic grows. Makes sense yes? Plastic falls apart into chunks, and the more chunks there are, the easier it is to break the next piece off. The creation of micro plastics is therefore exponential.

So each time a plastic toy breaks, the remaining pieces get even smaller and soon you can end up with pieces too tiny to even see. Just micro plastics, sitting out of sight but far from gone.

Because plastic does not ‘vanish.’ Even invisible it survives, resisting oxidation surprisingly well, and while some make get locked down into soils or sediments, many other fibers and fragments are building up nearly everywhere.

And get this, the current of fragmentation is likely a ‘faster than even the rate we produced it’ rate.

To walk you through it, plastic from the 1950s is still fragmenting and building up next to the plastic we make today. The process is a cascade, with micro plastic abrading existing plastics even further and all of it spreading to the point that it is now carried in the wind, the water, our blood, our brains.

(health/bioaccumulation of plastics)

This is one of the scariest studies I’ve ever seen, with the biggest takeway being that in 8 years micro plastics in brain samples jumped up an average of 49%. Current median level is ‘a crayon’s worth’ in a typical brain, and the growth rate is likely accelerating. Please absorb that. In 2010 micro plastics were barely understood as a reality, and now just 15 years later there is a visible accumulation of plastic inside your skull. In each of us.

Far beyond talking about single use plastics or garbage patches in the ocean, the worst micro plastic pollution is wholly without precedent.

So let’s take a step back here for a moment and analyze this situation. We apparently have microscopic pollution of an unspecified kind (there are a lot of types of plastic, and untangling them from each other will itself be a tremendous feat), it is building at an exponential rate, and its discovery in our bodies is so new we’re uncertain of its effects. Is this a problem? Well clearly no one was really expecting it, so we have no records of plans for this scenario.

What do the studies say for right now?

Unfortunately our first studies (all done in the last 15 years, and most in the last five) are showing a direct correlation between amounts of bioaccumulation and stroke risk, dementia, and systemic and localized inflammation. This is bad enough, but the problem doesn't appear to be purely human either, with some studies suggesting micro plastics are already reducing Earth's general photosynthesis by as much as 11%. When we go sampling plastic fragments are already in all garden samples, food samples, and every complex organism from the bottom of the ocean to the birds in the sky. Likewise it's build-up is so evident across the planet that it shows in albedo satellite measurements, a .005% light signature.

And let us be clear – these are all measurements *right now*.

And while governments currently may be talking about banning plastics, or controlling their use, no one has any concept for what you might do with microscopic pollution. And btw our plastic production keeps going up. Which is damning, because even if we stopped all plastic right now, we probably only need another 16 years before accumulations become life-threatening.

Let's do the math on this.

If we assumed linear growth

2032 : 0.75% brain weight
2040: 1.0% brain weight
2048: 1.25% brain weight

Or if we assumed exponential growth (as the author suggested)

2032 : 0.88% brain weight
2040: 1.53% brain weight
2048: 2.68% brain weight

Very rough estimates of course, but of interest? We have NO IDEA how much plastic in the brain is a problem. I mean logically you probably won't be thinking too well with a brain of 50% plastic right? I'm not saying your brain tissue goes away, but there is only so much space in your skull…

What about 10% is that survivable? Believe it or not but most strokes destroy less tissue than that.

In honesty, I'd be willing to bet 2% is quite bad. Like, brain no work so good bad. You might not die, but that amount of brain loss is a concern in medicine, and plastic pollution would be a lot more like a constant poisoning than a healable injury.

And 2% doesn't our math suggest this might show up as an average in samples by what, 2040? Maybe 2048? Funny how often that 2040 figure is showing up, isn't it?

More – with this problem, who even is in charge do you think? Who is it that should be dealing with micro plastics, assessing them, performing studies? As far as I can tell with a timer already ticking down to 2040 we don't even have international recognition of the problem yet. Hopefully there's an individual level solution, but

really what could keep you safe from something now in the air and water and around all your food? How do you transport anything and avoid plastic?

You know we don’t yet have a wait to filter solid tissues right?

What a mess plastic is then, and a full failure of human imagination. Even if this study is wrong, the plastic fragmentation problem would remain. And there are plenty of other studies that suggest your heart, your organs, your entire body are rapidly become just as fucked.

Companies & Inequality

“Enshittification” was a popular meme for a bit, making the rounds online in many countries. Even more common for research and commentary is the (loose) saying ‘everything is getting worse.’. Not one thing like rent, but jobs, stability in general, crime, prices, marriage partners, social media, credit cards, uber, door dash, movies, apps, the whole of everything too. It’s like a sense of discontent and discomfort has descended down upon a huge swatch of the world.

It’s interesting watching this cultural phenomenon from within the practice of our heuristic.

One conceptual version of the discontent I often see is the ‘metacrisis’, and some very smart people like to mention and claim it as the primary cause of current events. Overshoot of earth’s resources is usually the core theory, and I find that concept very very convincing. 96% of the mass of animal life on earth is now purely human driven, which means the rest is just…survivors really. The souls we haven’t picked off yet. BUT, I am unconvinced overshoot really describes everything going on. Too many of us is another way of thinking about overshoot – too many mouths and not enough resources, otherwise known as overpopulation. We could pollute all we want goes the thinking, if there were just less of us to pollute. I wonder though.

As an example, isn’t it looking like *any* amount of nitrates cause cancer? So even in the overshoot scenario, if all 10 of us are going around making nitrates, we’re still going to have a problem yes? Maybe in the overshoot scenario we’re ok with just a small amount of increased cancer? I guess that could be it.

But what about plastic? Even with a small population immortal plastics are eventually going to be a problem no? Nitrate might break down eventually, but does the plastic?

I think the core argument in overshoot is that we’re going to DIE from destroying the planet, not that overshoot alone causes us problems. And my response to that death, is to point out we could still all die from our bias, even if overshoot wasn’t a problem.

So to me bias is more primary than effects of the bias.

So let’s deal with some facts. We all have a conservative bias and we talk about it all the time. It’s just a different framing for most people than just saying ‘bias.’

As humans we have a tendency to not talk about the things we do not want to happen. We do not plan for things we find unpleasant. We are (unfortunately) intellectually and emotionally uncomfortable with some very common things. We don’t like to talk about sex to children, we don’t like to point out our fathers shouldn’t still be driving, and we don’t describe our bowel movements to our doctors (who don’t want to hear about them).

Does this reframe my heuristic for you? Humans have a desire to avoid scary and unpleasant things. That's why their unpleasant. We think we're *supposed* to avoid them.

Now what happens when that gets *worse*?

Humans under stress make worse choices. It's a pretty tried and tested fact at this point, and it's the exact reason we put recruits through training in the armed services. And now think, if we were making poor choices in 1972, when Limits to Growth was being made, how much worse are the thoughts of a plastic-filled, corn-syrup fed long COVID sufferer in 2025? Or how about those of a third-generation billionaire who inherited his wealth and has no emotional control?

Tell me, what does Nvidia produce? GPUs right? What if I asked you instead, what does Nvidia produce by monetary volume?

Well that would be stocks.

What does Tesla make? Cars or investment surges?

Remember our conversation about overshoot? How we have only so many resources and so much capacity and we're overwhelming what we already have with demands for more more more? Did you know we're doing it in a purely theoretical world too?

Let's go on an adventure for a moment – let's assume that Earth and all of earth's physical systems are fine. There is no danger of any kind building anywhere. Earth is perfectly ok with all 8+ billion of us, and things are getting better for everyone all the time. Many people believe this today!

To them I'd like to say – why then does McDonalds make more revenue from a good news article than they do from making happy meals? Why does talk of a company promising 'AI innovation' cause a surge in stock prices larger than that same company's earnings for the previous year? Why can the cycle of 'talking about a shortage' > 'reducing production of items' > 'interviews about new factories/production' > 'return to previous or just barely above level of production' consistently create billions of dollars of new investment for a company that's not actually added any new capacity or clients?

Or to put another way, why does a company that makes 100 billion a year of profit (which is huge, no doubt, but also inflated compared to every other year) have a 2 or 3 trillion-dollar valuation?

Is Elon Musk an engineering genius, or just a performative agent driving valuations and excitement from investment sources?

Luckily I don't have to know, and the answer might not really matter.

What is important though, is why is his relative power continuing to increase versus everyone else?

In 1900 to 1915 there was a period of extreme inequality in the US and several private public entrepreneurs who owned multinationals and dominated entire supply

chains, just like today. But then, after a series of excellent journalist investigations, many cities, states and even countries started anti-trust efforts against these same figures. The efforts were at least partially successful, and in order to keep sales going (and not be thrown out of society all together), Rockefeller, Carnegie, and Hearst all started to fund social enterprises to redeem their names.

We have a bit of this today, but like everything else so far it has just turned…shitty. JK Rowling has decided to fund anti-trans lawsuits for some reason. Elon Musk has joined a political campaign, fired half a million federal workers, and then immediately gotten into a fight with his own candidate and left government in disgrace. Bill Gates has decided to give his 200 billion to Africa, a very noble pursuit, right? But remember our bias?

I wonder, what are the implications of having private individuals with so much power they can alter the fate of continents on a whim? Should he have been allowed to act so unilaterally? What if Mexico had needed the money more? Or Flint, MI?

This authentically isn't me getting on a soap box. I have no stake in what Elon Musk, Bill Gates, JK Rowling or anyone else does. I am interested in how big actions get taken though, and what drives them. And how we're permissive with these sorts of behaviors, because they must be more valuable than an unknown outcome.

Society is about getting us what we want, right? Surely it can't anticipate problems?

Another observation – the last pride parade I attended in San Francisco was around 2017 or 18 I believe. I didn't march that year, my husband and I just sat down in the bleachers somewhere shady so we could see Barney Frank go by. And he did, fat and happy, in about 60 seconds. But then, not too much longer after the twirlers had gone by, and most the cute boys were done prancing, an army of blue shirts suddenly appeared down Market St. These were the Apple employees, each of them decked out in Apple shirts, and marching side by side, at least a dozen wide.

And many thousands deep.

No other marchers then, no streamers or booty shorts, just thousands of average employees of all types marching together with a corporate logo on their identical shirts.

This went on for ten minutes or more, and became a bit of a notorious moment in SF pride, and I was there for it. A good estimate is that at least half the people marching in pride that year were Apple employees, summoned by corporate fiat, bused from all over the bay area. A nice big display of corporate power consisting of many thousands of straight people marching in the middle of my colorful parade.

Apple didn't so much contribute to pride that year as *invade it*. I'm sure they thought it was very supportive. I thought it looked *polluted*.

And that is precisely my point with all this company-bashing: I am worried that even in a perfect world of no problems, human institutions might be doing things we don't always intend and don't think our way through. I am worried about the

growing chaos of state and societal institutions and companies all on their own. I worry about a world where power is concentrated too much in too few hands, outside of lawful institutions, and JK Rowling can quite pick on any group of people she likes. Where Apple can buy its way into access almost anywhere. There might actual be some strange dangers here.

For one there are less companies active in the world today than there were even 10 years ago.

Likewise there are now more money in private markets than public ones, and public companies are being continually bought and made private by equity firms.

Is there a plan here? Is there perhaps a reason more of humanity wants to all work and not run a business? Or is that some of us are forcing *their* plans on the rest of us? Is there a reason for this inequality?

I would like to hear it please, with a full reasoning.

My suspicion, unfortunately, is the current worldwide moves in capital and corporations are not being firmly planned out. I suspect there is no formal conspiracy at scale, no single motivation behind such activity (beyond more), I think we're all just not worried about what's going to happen and so we're letting it happen freely.

Still, I wonder what happens if we follow the current trendline here? 10,000 companies in the world eventually reduce to 1,000? 100? 10? At what point *do* we imagine that's a problem?

What's fun here is that I'm not authentically sure if this is a problem or not. I have vague theories that at a low enough number competition between companies would transition from purely financial space into much more physical territory. And not 'stealing secrets' or 'burning stores' like they did in 1910. No I think more like Dutch and British East India companies, launching invasions and burning ships.

But I really don't know.

Let's consider another angle though: what about when a country reaches 10 trillion in valuation? Or 100? You do realize that this makes many companies richer than many countries yes? Even today we know Rio Tinto has weaponized and invaded parts of Africa, but what could it do with 10x more resources? Is there a reasonable method of stopping them? Boeing has been accused of a conspiracy to hide faults in its plane construction, and of working to conceal the fact INSTEAD of fixing their planes. People have died from this, repeatedly, and yet Boeing keeps making these same planes. And worse, we actually have to use these planes! And why?

Because there are now only two major plane companies in the entire world.

And just like that maybe we can see that the number of plane companies, like car companies, computer manufacturers, electronic parts, food, beverage, clothing, video games, movies, media, internet providers, etc, has already collapsed.

Just like in the real world, our pretend world has had some strange population loss.

As an aside: If we keep following this observation back into reality, with all its chaos, I would suggest that corporate consolidation is a fine example of a system undergoing catabolic growth. We're trying to expand on ever dwindling resources, and showing the sort of activity you might see in a starving animal. Muscles and fat are consolidating (companies getting rid of competitors) and then draining away, leaving only the skeleton and barest functioning organs behind (private equity selling assets and closing doors).

Health

Rising homosexuality and transgenderism

Full disclosure, I myself am a gay male and always have identified as such. I've fought for marriage equality on 3 continents over 20 years, and have helped several close friends in their transition. I support T people, believe they need full and equal rights, and resist those who say otherwise.

With all that said I can still *notice things*.

One thing that I've seen as time goes on is a significantly larger amount of individuals identifying as gay or T, especially amongst youth. Some of this makes sense, but the raw *amount* has been surprising. And what's odd is the increases haven't been similar. Whereas before 2000 one might find a single T person amongst a gathering of 40 or 50 LGBTQIA+ folks, now it's much more common. Do T folks in particular finally feel more comfortable being out? Or being labelled as such? Is there less demand to 'pass'? Once upon a time I knew that many T folks were invisible and so I have to assume it's the same now, but still so many folks identify openly! On a population level it's kind of curious yes? And it makes one wonder, have there *always* been this many T folks or are they increasing?

(health/ ST_2025.5.29_LGBTQ-experiences_00-0)

As it turns out a greater percentage of young folks DO self-identify as T compared to other age groups. So something must be happening with youth belief/practices then? Or else something must be happening to bodies?

It doesn't quite make sense to me that if being T were more permissible, that only the young would be identifying as such at a 10 to 1 rate, but obviously some amount is going to be this. And if we were in a silo, I might state that for the rest, we should simply be happy and accept a T rise with open hearts.

But us here? Questioning the end of Earth? We can look wider:

Endocrine disruption is real phenomenon affecting animal populations worldwide. The sheer amount of chemicals found to have endocrine disrupting potential is growing with every issue of Science, and unfortunately given that 'forever chemicals' are now being linked to endocrine behavior, it may not even matter if overall production is growing. The reality is that accumulation means chemical burdens grow now regardless, and won't stop anytime soon.

Chemical waste levels rise –> homosexuality/transgenderism rises. Short or long term rewiring of growth processes cause brain structure changes. Is this happening?

Is some amount of each pride parade there partially because of chemical waste, rather than political and personal liberation? I hate the idea, I loathe it, but that doesn't mean I shouldn't consider it. If anything I should scrutinize it more. And there's at least one lens that makes this a bit easier to consider: wouldn't it be wild if LGBTQIA+ was a bit less caused by parents, permissive laws, woke media,

immorality, whatever - and more because we aren't cleaning up after ourselves? Imagine it, the real cause to some peoples' dislike is that *they* also went out and overturned clean air laws?

I have some possible evidence beyond just rises in pollution.

For one, if the rise in transgenderism was memetic in nature, I would guess that we could look back in human history and find a period of transgender memeticism as well. Just as gay folks have had high moments, the renaissance, many courts and kings, some artist groups and the occasional tribes or army, there should be a society or two where for a while transgendered folks rule the roost yes? I have not found it. They are often (almost always) treated much better in tribal societies, but a time where all the straights wanted to be Elliot Page too? Not common in my searches.

And what about the 'response' to transgenderism? The backlash and populist framing we see now of transgendered folks as an issue for society? Are we thinking that more folks are coming out because they feel freer, less threatened, while at the same T peoples are being turned into active scapegoats? That seems…counter-intuitive? I'm not saying no, but unless there's a drop of T identifying folks in the next few years, I would say how 'comfortable' people feel might not be the only driver.

At the core here I am simply interested in prevalence, a health concept. I like gay folks, I like trans folks, but if our environments are influencing us we should be aware and wonder what happens when the process is completely uncontrolled.

How many people could end up T? And if that's a tame or even happy change in the human race, what about other changes caused by the same general processes? Will they all be happy too? I would like to know.

Autism

Again, autism is fine. This section isn't anti-autism; it is population prevalence. Remember the conservative bias? We need to be able to see when something frightening or uncomfortable is present.

We need to be able to talk about *anything*, so what about autism?

(health/Rising Autism)

It's startling the first time you go looking into autism and find out how many sources show the same trend as this image. Since 2000 autism rates have grown by a factor of about 5, to the point where now 1 in 36 children likely has some form. Why is this? Are we indeed simply screening better? I've watched new screening measures be introduced in public health (in a few nations now) and seen incidence increases because of it, but I'm not sure I've ever seen a 5-fold increase inside of 20 years. Let's be generous and say we're screening better, and just finding 'more' of what was already there. The next question is: where does that stop? I mean, if the screening is still finding more and more, and our screening is getting better by the moment, why imagine the graph is about to stop its climb? What is the REAL autism rate? 1 in 10? 1 in 2?

Or, conversely, have you considered that this rise in autism prevalence might not be due to different screening at all (or only a little)?

I invite you to truly look at this graph again. And I mean, look at it. Don't write what you want to see into it –it's fairly simple, between those born in 1992 and 2012, autism has jumped fivefold. I like to consider graphs on their own, and when I look at this one I could very well be missing a huge roller coaster of context. Or, maybe, the trendlines…just continue? Hard to say. Maybe autism came into being sometime in what, 1910 looking at those numbers? Likewise,maybe whatever is causing this rise in autism won't go away. Maybe it'll keep increasing. Using these numbers, we'll see 1 in 6 children with autism around 2040 and after that we'd have what, all kids born have autism in 2065?

What is the max rate of autistic folks a society can function with? Many instances of autism aren't too disruptive, though of course the rates of nonfunctional or low functional autism are ALSO increasing. But why? What if it's to do with an actual rise in autism? Remember our transgender talk from a moment ago and now look at this autism growth, and ask yourselves: what if human bodies are being altered by something?

We have studies showing we're reading less, that people are having more self-reported difficulties with reasoning, that we're more disabled, and having more problems concentrating. Academic testing metrics are getting worse worldwide and the Flynn effect appears to have been dropping in many countries since 2010 or even 2000. And I'm not saying these problems are all associated with autism, but the effect also appears amongst those *screened for autism* too. So if autism screening is so great now, we need a completely different explanation to account for all these non-autistic metrics

So what, if instead of any single condition, our problems are more generally cognitive in general? Or even more physical? What if there are a lot of different factors all at work at once, and lots of different manifestations are happening all over the world? What could cause such broad, international effects? Whatever it is, it'd have to be…everywhere.

That's starting to sound a lot like pollution to me. And maybe the reason we reach terrifying levels of autism around 2040 (or even before) is because pollution really is swelling now on its way to population crashes.

That's exactly Limits to Growth BAU.

<u>"Forever" chemicals</u>

Something interesting with forever chemicals – did you know there are markets anticipating their growth? Think companies involved in filtration manufacturing, health conscious services, even private equity that are anticipating the continued worldwide growth and exposure of humanity to these chemicals. Private equity groups have especially published plans on how to capitalize and grow their businesses based chemical growth. Given how the FDA in the US continues to drag heel on labelling and banning these substances this planning does make a great deal of sense! Or it might, right up until one realizes what this planning actually

implies. That's right no one is expecting this problem to do anything but increase and increase, which of course means we're all going to get sicker and sicker, and faster too. Maybe some method can still be found at scale to filter the environment, but barring that what is the plan? Is there an expectation that the wealthiest might be able to mitigate their exposure?

So far the evidence does not support this, and countries with the highest GDP are almost universally the most exposed to these chemicals. There also seems to be a fundamental lack of understanding about biological exposure. When endocrine disruption or neurologic response occurs in a human due to such exposure, the damage accrued is not generally 'gone' even if we can filter the chemicals (say via blood giving). Damage done to endocrine systems can be quite permanent.

Prevention then is the only real human protection, and these organizations are doing the exact opposite of that. How strange that its now doubtful a 'pristine' human will happen again.

<u>COVID</u>

There's a lot about the first few years of the pandemic we could go over, but that seems very low hanging fruit. I think we can do better, and focus on the now to boot.

First a simple comparison: 96% of polio cases were mild, with no expectation of long term damage. Meanwhile long COVID and disability from tissue injuries from COVID look to be 15% or more per infection. Differences in vaccination rates for each illness are just as stark. In many places Polio vaccination was 100% within a few years of introduction, and maybe there was something special about Polio? Or likewise maybe there is something special about COVID now?

Of possible interest is that information about disease is far more readily available today than during Polio, and yet attribution of risk is much worse. Somehow we feared Polio when we knew less about disease, or maybe we believed more in public health? I'm not sure but clearly something is either different about our institutions now, or about us ourselves? Or was it the educational methods used?

From a medical perspective there is still very much unknown about COVID, and especially its relationship with mast cells and the disorders of such that can arise post infection. Yet after that initial first wave of COVID study in 20/21, any additional research has moved at an absolutely glacial pace. And now we're in 2025 and yet still disability, excess deaths, even long COVID numbers all continue to rise. Where does this end? Is the pandemic even over if population level changes continue to grow? Why do we see further increases and trendlines for something that's 'over'? Well maybe it's not over. And pause for a moment, do the COVID trendlines not remind anyone of lines we've see elsewhere?

(health/disability increases)

I wonder what percentage of a civilian labor force can function with a disability before the workforce becomes only partially capable as a whole?

Oh and I wonder, have you considered the last 3 problems in tandem? A population with more autism, more chemical exposure and more COVID disability, all together? Physical-based cognitive difficulties layered on top of each other, and nothing prevents all from happening in the same person at the same time.

Fertility Rates

I think worldwide fertility rates may have to enter into our analysis. It's too big a problem not to be important, with every continent affected and what looks like now a majority of countries too. How wild is that? Yes, sure, everyone knows that the South Koreans, and the Chinese, and the Nordic countries, and the Japanese and Italy and Russia are all shrinking, and growing older, but that doesn't make it a collapse scenario surely? Not until you realize that the full list is…scores longer.

Once again, let's just follow a trendline together – just like Japan keeps doing in its warnings to citizens. Anyone who has worked in a SNF or AL facility in the west is aware we have folks dying now from lack of personnel, and that's in nations with 'healthyish' demographics. The Japanese assessment is they have a care crisis now, a catastrophe in 2030, and that nothing makes sense around 2040, when the country will be short around 11 million workers and 1/3 of their population will be too old to work. That's…pretty stark. A good accounting of a possible shortfall.

I'm curious what's causing the low birth rates though? Is it just a cultural phenomenon that wraps the planet? Is it that wealthy persons do have less kids and we're all wealthier? Could be, but we've got a study of the US and wealth that finds similar levels of 'less kids' for every single income bracket. So maybe it's more of a national threshold and once you're beyond a certain level of wealth, you just don't have kids?

I have no answers here and no firm conclusion other than the situation does remind me of the Universe 25 experiments. I am the last person to say remove a man from his science so let's immediately state that Calhoun had biases *aplenty*. He seemed a Christian utopia fanatic even in his most lucid work, and yet his experiment *have* been replicated and do fit a certain logical population sense. Too many creatures in too small a space leads to too much stress to make mating comfortable or easy. Put enough mice together in a tight space and it doesn't matter how much you feed them or how comfortable they otherwise are, their numbers will eventually plummet.

Makes me wonder, have you noticed the memes on the internet about how hard it is for today's youth? Doesn't seem to matter which language you speak, there are examples. Laying flat they call it in some places, or herbivore men. Incels, or women in China who reject male partners and embrace leftover status. This could be a media nothing, absolutely. But birth rates are down almost everywhere, and so are household savings. And on the three continents I could find, home buyers are older than ever, and the percentage of population renting is increasing. So right now there *is* less space for the young.

Where does that lead in the future I wonder? Do we humans end up like Calhoun's mice, all well fed but constantly rubbing shoulders with our neighbors?

And with so many roommates that we never want to have children?

I think on some levels that sounds a fantastic result (well, minus the crowding) but it’s worth noting that all of Calhoun’s experiments ended up with mountains of dead mice and degrowth. And most people do not want an economy that degrows on them.

Japan is full of empty houses right now, and most aren’t worth much compared to new construction.

Governments

The destruction of the Aral Sea was prophesized about for 20 years at least before it finally (all but) vanished. Walter Raleigh was given specific warnings about the regular use of tobacco. Exxon-Mobil was quite well informed on the realities of climate change (using predictions more accurate than some used now) in the early 1970s. Climate change and overpopulation were described in very specific detail in the 1890s, including in a series of reports collected for Illinois' World Fair.

So it's not that governments aren't able to find information or given warnings, it's that they choose not to act. Or worse, when short term gain is prioritized over national health, a problem can be identified and simply ignored or pushed until later by a political machine servicing its own needs.

Not too long ago Australia introduced a superannuation fund, a sort of required savings account for every working Australian citizen. The fund's concept would be to create a retirement nest egg for each citizen and help reduce government's eldercare costs but unfortunately no one closed a loophole (intentionally) of letting older folks buy homes with their funds right before retirement and then just default to taking government pension anyway. So the resulting boom in house buying meant that within a few decades Australian housing has become some of the most expensive in the world, with it reaching the 'most' expensive by 2025 at the latest.

Now there have been 9 prime ministers since Paul Keating in 91, so let's say we've had somewhere around a dozen 'well-informed' elections for brevities sake. Yet nothing at scale has ever about this issue since 1991? Right up until today the vast majority of Australians ever polled have agreed the loophole is a problem, yet there has been no government movement. So what do we make of this?

The Australian government does a budget each year so we know they have that, and their own reports, and the general rises in house prices before them over and over again. Did it not compare to other issues? Well surely there have been *other* issues more important, so maybe this was always just never the biggest issue? That line of reasoning gets interesting, because of course any problem is a value judgement. But something to note, a national broadband network and a series of nuclear submarines bought from overseas have featured in the last 5 Australian elections, often as primary issues 'over and over'. Yet either one is literally 1/50 (or indeed much less) of the expenditures the government goes through each year in extra pensions paid out to owners of inflated homes. So at the very least money must not be that important in the value judgement then.

The biggest highlight I have in this situation is that again we see a pattern of risk assessment that might be quite wrong. Government doesn't address the problem because it doesn't care to, and because it assesses it as 'low risk'. Or at least not important enough to fix now. And so the problem accelerates, gets worse, etc. Sydney already has an index of 15 times housing to wage, highest in the world. It's at the top spot and yet still no traction. So one does wonder, when *might* this become a problem that is pressing? Is there a threshold, or is this just a nothing that doesn't matter?

This is where bias correction comes into play.

I will venture, right now, that there is housing problem in Australia of a systemic nature and it will lead to a catastrophic, nation-altering problem. And sooner than the government in power today expects. That's the nature of our bias correction. The government does understand there is a problem (they've said so themselves), but the implicitly place its terminal location somewhere safe. We do not. It's been a problem for 30 years yes, but that doesn't mean the situation is stable. There's bond runs on markets in 2025 that are both currency and debt related, and inflation is still persistently rising. Australia will be dealing with a mineral shock from the China/US trade war, and with the Middle East conflicts. So I don't think danger is far away as the government thinks, and if I really had to guess (we'll pretend we're in the prediction section for a moment), I don't see how Australia pricing can be maintained when world finance fluctuates into silos. So I'll give it a year or maybe two, before housing corrections begin at scale. So let's call that a major correction between now and the end of 2026. Bold right? We'll get into why in a bit.

For now though, let's talk about the government dysfunction a bit more. I'm very interested in general reactions of governments to stressors/problems today, as I think they further expose the biases I've talked about.

Doubling-down is a positive feedback loop that's been noticed in some systems dynamics research. There is no universal perspective on it, but let's continue with our superannuation example. All those federal elections with the problem there, growing, but unacknowledged? Well it wasn't completely unacknowledged. It was often spoken about, plans were even suggested (a first time home buyers grant has been issued before, literally trying to reduce costs for youth), but when interest in the subject didn't pay off as much as interest in a broadband network, Australian political parties talked about the network more. Whether this shift was planned or evolutionary, nonetheless governments discovered elections could be won without dealing with the problem. So then the next election, when the winners wanted to win again, they decided once more to not deal with the problem. No firm plan, don't really address the issue, make other things a priority. Which of course meant that over those next 4 years, house prices went up even more, making the issue even worse for the next election.

Do we begin to see a feedback loop here? If something was hard enough to do when it was easier, each time the problem accelerates then dealing with it will take even more force. More effort. And at some point one wonders if the problem even can be dealt with like a typical smaller issue before the real solution involves something like a 20% tax on ALL voters. And you will not win an election saying that.

You could try to sneak through a solution after a victory of course, some intervention you didn't run on but that needs to be done, but in just a few years you and your party will have to run your next election with that hanging over your necks, won't you? Is that doable?

It hasn't been in Oz, and so house prices continue to go up, and only the old and rich have homes while everyone else rents at 800+/week. And surprisingly

Australia is a country that (until recently at least) didn't ever have very large election cycles or strong confrontational politicians as the default.

Let's look at another country then, and compare.

It's been interesting to assess the 2025 draw down of the US's NOAA and weather/space services in light of 2024's brutal hurricanes, and one of the largest coast to coast droughts on record. Nor does it make any more sense with the heat the nation experienced, or the LA fire which killed celebrities and homeless alike. All these events made headlines, certainly, but most only for a few days (even the hurricanes).

The presidential election however, and the results of the first 100 days especially, have made nonstop headlines.

So what is going on here? Is the administration making government more efficient, and unnecessary waste being halted? I often like to consider the events from that lens and yet the timing still seems quite strange to me. 2023 has an 'unexpected' heat burst, 2 of the hottest years ever result, some of the most extreme events (hurricanes months ahead of schedule, fires in North Hollywood, floods in Vermont, etc), and then we choose to defund weather offices? Why now? Why not in the first term? Why not 30 years ago? Likewise why these services and not say more of the military, or corporate funding schemes? Why would a year with bad weather be the year to make us *cut* weather forecasting?

Now of course we have a supposition about fat-tailed outcomes, and the tendency for humanity to put answers 'where we want them.' I find it works very well in this situation. Here's why:

As an experiment, can you imagine what it might be like if most humans didn't want there to be a climate crisis? How might they act if they didn't want to believe there is any risk or danger in the climate? What would their response be I wonder, if the climate WAS acting up at the same time?

A good American situation with similarity might be before World War 2, when the US was resistant to the European situation. We created America First (the first time) as a response then, as the majority of the population really did not want to be involved in another European war. Elections proved we did not care about it, or want to suffer for it, and instead we preferred our isolation.

And isn't it funny, by the time we changed our minds and sent our ships, we now had fewer allies in that war than we might have had with sooner action.

I view both scenarios as doubling down – a response by some systems to become more solidified and more brittle in the face of stressors, going with what 'worked before' rather adapting to changing circumstances. As a nation the US could be acknowledging the climate is verifiably changing in our own local measurements, and then planning interventions or adaptations at scale for new events. Instead carbon taxes are repealed in many places, oil refineries and gas power stations continually built, and our carbon output increases at accelerating rates. We even dismantle some of the organizations that just *track* climate change, essentially so strongly convicted that the theory cannot be real that we don't even want to look.

For a moment, please look at that behavior again as if you were an outsider. Does such a series of actions not appear…psychological in nature? If one was trying to prove a bias (climate change isn't real, the weather is unrelated) wouldn't one want to fund research into proving it? Take those same institutions you just closed and instead give them your value statements to assess? I guess not if you're so certain of your facts – but again, if you're wrong, that must mean you have quite a big conservative bias.

Only confidence can breed errors this large. And if we're confident…then I'm also not sure how we're supposed to figure anything out. Maybe we 'know enough.'

But how about *I* take a step back for a moment, and look at this situation a little larger?

It's possible that some folks want climate change to be a problem in 100 years. And clearly some want it not to be a problem at all. Do perhaps I want something out of climate change? Am I putting a value there? And if so, how do we tell which of all of us is correct (if any even are)?

Well I think by now you're probably start to seeing my solution.

The real difficulty we face is that I don't think our problem is anything like climate change alone. And my general supposition on bias is that very few people have assessed its extent because, well, none of us assessing ANY problems very well. I think the climate could be entirely fine, and the other 80% of this document would hold up perfectly ok. And yet the climate doesn't *really* appear to be ok from observations.

From the viewpoint of our bias, the reason governments all over the world are resisting climate change narratives is likely that they don't want to face the implications of such theories. Some proof for this is that they're doing the same thing to completely different problems as well. Consider debt crises, or pandemic preparation. How about infrastructure repair? Did you know Cuba hasn't updated their power plants since the 1960s? Did you know American hasn't truly update its national highway system in that long either? Why is this?

How do we tell when something might be a problem?

Studies on only certain subjects > scientists who create for publication, leaving out anything extra > committees of scientist and policy makers who 'condense' > news media who must make any stories 'marketable' and fit for the amount of air time available > politicians who run on soundbites but won't ever attempt to tackle difficult legislation

This through line is hyperbole of course; in real life there are many, many more stages of digestion. But I have noticed that even if we go to primary sources, twitter feeds of individual scientists, pre-prints, the stories the first person tells are almost all more severe than the stories OTHERS tell about them. Yes the scariest single lines often make it through to the end, but all the context, the implication, the 'we should study next', is reduced. This means even climate change is almost always worse in the study you read than when you read about it somewhere else.

So are field reports from etymologists, or the tourist authorities in Galicia, or the commercial arborists in the PNW.

I'm going to forestall the 'unsubstantiated claim' argument by pointing out that many of us personally think digestion entities are often wrong. The EPA is getting mammothly defunded now, and can we think of reasons why this might not bother us? Could it be because the EPA has allowed PFOS/PFAS to spread to all of our bloodstreams? Or micro plastics to build in our brains? Could it be they *have* done their jobs poorly, maybe not in the way they're being accused, but just as a matter of record? Of course we should note that the legislation they rely on is insufficient, and so hasn't congress failed as well? Could it be problems aren't being faced and its fairly obvious?

Let's turn it around again. What if instead of focusing on those who don't believe in climate change, we looked at those who did?

How about an international organization world formed entirely for scientific and diplomatic cooperation and synthesis? And for once I don't mean the IPCC directly, but instead COP – now on its 29th meeting.

29 meetings would seem a lot, and so as a policy organization they must have come up with some recommendations in that time yes? The main metric of pollution used today is CO2 so the question might naturally be, what is the yearly CO2 level after the last COP? Last year's CO2 increase following COP 29 was….3.8ppm, the largest on record, and following the previous two years which were the previous largest on record.

The situation better be a lot more complicated or else it really looks like COP is failing, doesn't it?

Well, no, maybe without COPs things would actually be a lot worse? Maybe the organization works nonstop, around the clock and are really improving CO2 levels from what they could be? I think that's entirely possible, but still on the metric of 'is climate change slowing down from where we started,' COP has fully failed.

That statement is revelatory to me. Even with a climate change focused organization it seems the right of kind of action is more important than less CO2 now. Or to look at it from another angle, either COP is impotent or they believe we still have time to search for the right responses. Or maybe both.

One major decision in 29 was 300 billion from richer countries to poorer countries for energy transitions. Rough math is that this something like 50 new nuclear reactors a year. Now given there are roughly 2500 coal power plants active in the world right now, then at that rate of funding in about 50 years (assuming no growth is needed in electric power anywhere) we could phase out coal.

Not a huge urgency in timing right? And this from the people who are assessing priority.

<u>COP and IPCC are setting up failure</u>

29 COPS and CO2 rising sets a sort of obvious precedent, doesn't it? And it's not just them. If anything climate intervention at a whole is starting to turn a bit… traditional? Is that right? Think about it, don't you already kind of know what's going to happen at COP30? This many meetings and no one is expecting a sudden call for revolution or the dismantling of the WTO right?

I've noticed a bit of the same phenomenon with reports on 1.5C and 2C. Warnings come out, time frames are given, and then somewhere over the course of a few years, the warnings risk becoming dogmatic. A mantra. We will hit XX by XX. And never we will hit 1.5C by 2050, no wait now it's 2060, now its 2070. The numbers we chose as important are getting closer, not further, and over and over again we say this. The public knows of these as scary numbers and something to avoid, but then we get a year like 2024 where we appear to be AT 1.5C. And so doesn't our fear of things reduce somewhat?

I wonder – do these organizations even know HOW to get humanity to stop at 1.5 or 2? I've got some of their material so please read and decide. To me, it looks like a theory. A model. A hope. Not action so much as we *should*. An idea that in 29 years we've never managed to actualize into a plan.

And if it's been 30 years will we ever decide it's time for a plan? Or will we just do more of the same?

Failing States

Now let's attempt a completely different attempt to assess dysfunction and the conservative bias.

How many failed states should a world have at once? How many nations under stress can global order handle, before things like international trade suffer? How many wars and conflicts is normal for our world when it is growing and stable enough that the majority of human lives are improving? Not *everyone* thriving of course (no utopia), but the sort of world everyone has said we're in when we hear 'things are better than ever.' This is a world of people living longer, better jobs, more resource sharing, less dead kids, more old folks, and less racism/genocide/social disorder.

I don't have a number for the right amount of failed states, so all I can really do is compare today to say 10 or 20 years ago. Maybe *that* will tell us where we're trending?

Let's go through some nations today:

(please note – I am not denigrating or being intentionally insulting to any nation here. We're all in this together. I'm not listing these states as 'failed' either, just deteriorating from some previous point. I'm more interested in assessing patterns here than who is doing better).

South Africa continues to have widespread power problems and intermittent functioning of services in major cities. Of note here, the whole of Africa has about as much power generation as Spain, and electricity coverage has actually dropped in the last few years. In years past South Africa could keep the lights going when

everyone else went dark but no longer. Government dysfunction has been listed as a problem with the ANC still in charge despite no major (at scale) plans for infrastructure. Inflation.

Venezuela continues to have problems since 2012, most specifically in currency, power generation, and services. Elections have been boycotted by opposition and the country is believed to be losing citizens to emigration. Inflation. It does not refine its own oil reserves at scale.

Iran (ignoring international difficulties) has had currency devaluations and large scale inflation problems. It does not refine its own oil or gas at scale, and has faced a series of protests against the government in recent years. Power cuts have been consistent for several years now.

South Korea has recently had a series of government crises, including an attempt to declare martial law and arrest opposition party members. The government has been brought to a standstill for many months. The birth crisis continues with all-time records being reached prior to 2024.

Cuba has lost 10% of its population to emigration, and even its practice of sending doctor services abroad to collect income is reducing y-o-y. Power cuts have affected the entire island, with at least 7 major period of blackouts over the last few years. Foreign currency reserves are depleted.

Haiti has effectively collapsed since the abdication of government officials last year. The capital city is now controlled by 90% gangs, with a Kenyan police keeping force effectively abandoning an attempt to seize control back.

Assad has been forced out of Syria due to revolution. This is hopefully only a good thing for its people but it is very hard to assess going from a long-time regime to a brand new one. There are both negative and positive signs, but with Iran likely to fall and Lebanon dysfunctional, it's worth noting that Syria is going to have porous borders and little direct assistance.

Bolivia has been the site of continuing protests and highway closures due to conflict between two different leaders, and between rural and city dwellers over cost of living expenses. Inflation remains high and infrastructure has stopped working due to drought and power loss.

Ecuador's drought may be even worse, with so much of the country reliant on hydropower. Power cuts have been long and brutal due to a greater than 60% lack of rainfall for the year. Inflation. Many businesses have closed and unemployment has risen.

Myanmar's civil war continues with a full genocide and famine being alleged in Rakhine. The 2025 quakes have not helped the situation, and there is reason to believe the government used the quakes as opportunity rather than as a disaster.

Sudan's civil war has now engulfed most of the country, and continues to destroy more infrastructure at a rapid pace. It has been called 'the biggest humanitarian crisis ever by population.'

Bangladesh continues to suffer a currency crisis, and a power crisis.

Pakistan likewise continues to suffer a leadership crisis, and has both closed borders as well as promised (and showed signs of) expelling over a million afghan immigrants a year. Kabul is often listed as the city most likely to run out of water, which means Pakistan might be facing a neighbor in worsening collapse any time now. And Pakistan's own water problems are only beginning if India continues water re-direction.

We could do a whole series of these, but please note all these nations? 10 years ago (or thereabouts) all were considered relatively stable. This is just the ones that have changed recently.

On specifically government crisis alone, there is a strange pattern of behavior as well.

The US, Germany, France, Australia, the UK, the Netherlands, and Poland have all had elections within 18 months that were exceptionally close. Many legislative branches are now hung or close to it. Minority governments have become common, and some nations are experiencing their highest number of prime ministers in a small period time in modern history. Likewise 'upset' results have turned common throughout Europe and at least once now in Canada and the US (2016).

There's also been a noted increase in international conflict and stress between nations. India and Pakistan, Israel and Iran, Israel and Palestine, Israel and Lebanon, Russia and Ukraine, Russia and Europe, Azerbaijan and Armenia, Houthi and the US/Israel, have all occurred with the last 3 years. In fact some assessments put surface area under conflict as up 66% since 2021.

(governments/global conflict zones up by)

Additionally, an estimated 310 million people in 2024 needed international aid, and in 2025 the US began cutting its foreign aid. As the world's largest supplier of foreign aid, one can probably reasonably assume that the numbers for 2025 will thus be worse from just this change alone.

What do we make of these patterns?

The primary reason that the current US government is making is changes is (according to their leadership) to 'fix' the nation. To change trajectory, because there is recognition that the current trajectory is wrong. The primary reason COP exists is that there is a belief that climate change cannot be simply allowed to continue, as there might exist the potential for disastrous outcome. So clearly there is a recognition from governance that bad events are possible, and that we want to avoid these events.

I think we humans can mostly agree on this.

I think our next recognition should be then, that some of the bad events we don't like are happening right now.

Climate change, even if not at 1.5C, is effecting nations, economies and lives right now. Rainfall changes are driving droughts that drive political crises, just as

regional falling agricultural and industrial output are making physical goods more expensive for the average person. Likewise economic growth cycles have been prioritized in an energy-based system with diminishing EROI, which has then required the injection of increasing debt obligations into governments to keep GDP increases. Just as Australia is doing with superannuation, the state right now has been prioritized over a future even an election cycle assay at this point.

And why are we seeing governments fall at record rates? Because when a reduction in the standard of living is obvious, power changes hands. The reason we're seeing so many governments topple here (or at least threaten it), is because stressors like inflation, infrastructure collapse, and societal pain are being actually expressed *right now*.

Our through line for elections to policy to policy results is that governments haven't been dealing with crisis in the moment, and put the risk off until sometime later. But they have not understood when that risk really expresses itself, and they can't admit to it now either.

A larger number of countries are under stress now, because stress is showing up live in the earth systems every day. The stress in the system is being reflected in the stress on the governments, and it is no longer just bee populations flickering and disappearing, its human happiness and lives too. It's meals and jobs and lives.

We have more wars in the last few years because we've had more reasons to go to war. A literal war over water has just been threatened and still simmers, (India and Pakistan, both with nukes) an event that probably couldn't be more out of the early pages of Mad Max than if Max Rockatansky was a prime minister.

And now rather than face this reality, governments are fraying, doubling down, or simply losing control.

Please go read the records from around the world and see.

Soil Carbon Feedback

So the soil is absorbing forever chemicals, micro plastics, pollution in general and darkening as it does so, reducing earth's Albedo. Isn't that enough?

No.

Listed amongst the IPCC's known unknowns is soil carbon sequestration and its magnitude. This phenomenon is the general action of organisms to capture Co2 from the atmosphere, and put it in the dirt. It's actually generally a cooling property of soil is the estimate – right up until it's not, and therein lies the unknown part. The core concern is that with the right amount of heating, the biological process that capture CO2 might stop, or reverse, or…well this part has always been very generic.

This is probably because the IPCC isn't talking about which species of microbe, doing what, where, at what time of year, in what exact spot. The whole feedback as assessed is an attempt to parse down from infinite reality to some generic number, so we can try to capture something we HAVE seen, but never at scale. And I'd be a lot more forgiving of this process except that in AR6 we said soil sequestration was still taking place and then, whoops, we've found that in some places? It's *already* reversed.

Or that actually it appears to have reversed in many places *in 2008*, and that in the two decades since we've had yet another new source of carbon dioxide working against us, that we missed.

But wait, be aware that the ground in the artic has also likely become a force for CO2 growth as well, with permafrost now a 'tipping point past.' This is different than the previous sequestration reversal because in this scenario, thawed grounds can now support NEW bacteria that were never there, and all the formerly frozen matter can be eaten for the first time.

And there's another one! We also have the effects of constant wetting/drying on soils, of extended droughts that change microbiomes and allow blooming, and of drying dying plant life that cause bursts of hungry microbes and contribute to wild-fire/soil erosion mechanisms.

Soil as it turns out, can be wickedly complicated and the IPCC itself admits that it oversimplifies almost everywhere. Not just in prevalence either, but with magnitudes. As an example, the IPCC lists (again in what they admit will be an underestimation) the possible release potential of artic permafrost as 14-175Gt CO2 per 1C. For that potentially means that for every C we pollute, we get 10% more for free (1500Gt is around 1C in some ECS – you can absolutely dispute this, but then you probably need to go *higher*).

Hopefully the other soil forcings are nowhere near that strong, and yet we've got a paper showing even they are underestimated by a factor of 3. It's so bad that .3 or .4 of our 3.8ppm/year increase is now likely due to soil alone, and this feedback is quite uncontrollable. It's not even us anymore.

Soil loss

And just one more trendline with soil:

The rural home I live in used to be the site of a farm in the 40s and 50s, that was then given up in the 80s due to soil depletion (and rising property value). A stand of red alders was planted at that time, and now in 2025 the soil underneath the alders is visibly and tactically a world apart from the soil just 10 feet away, which was left to grasses. One region of soil is rich and can sprout any plant I want in a season, and the other is dead enough that water passes through it in an instant but ONLY when it can penetrate the crust of the surface.

This is apparently a worldwide problem and of biggest interest to me is a general number given in a number of sources – 2060. This is apparently when the world doesn't have enough remaining farmland to farm at current levels.

Just another trendline and data point for us to consider, though this one is decidedly weaker.

Limits to Growth

You know by now I hate models. They're tools dammit, and should be dropped an instant after they provide a figure so we can look up and wider.

There is a model however that attempts not to be as specific as possible, but instead to take a broad systems view of earth and STILL be predictive (50+ years in fact). This is a model that recognizes the futility of accounting for every individual metric and instead attempts to capture linked, dynamic movement across an area as big as the planet.

Made in 1972 its calculations were intentionally simple, and yet I believe this model remains the most prescient and accurate description of earth trajectory that I have encountered.

It's definitely not a heuristic, and links things much more explicitly than us, but it thankfully also discards minutiae. 150 or so derivatives normalized to a few excellent curves is all this model needs. Factors are defined in relation to each other as a focus, and direct relationships are primary. It's quite genius and shows that a wider view can nonetheless be prescriptive, and that strategic thinking can still inform wildly.

It also predicts the end of the human race. So of course we need to talk about this.

I want to look at this model in 2 ways – 1st I'll walk you through what I see in the original LTG (Limits to Growth) and where we are in early 2025, and 2nd I'd like to attempt to improve the model. To 'bring it up and out' as we've said in the 3rd heuristic. We're going to keep to LTG runs 1 and 2, also called the BAU (Business As Usual), because they match reality best, but feel free to look wider if you want.

Please note that in both runs, 2040 ends up being a year of heavy inversion. It's not the point where everything has fallen apart, and neither is it the point where descent in metrics first start. Instead it ends up being the year of 'the most change we care about.' The year when most metrics (services, food, industrial output) are in descent and so that lives that rely on those metrics will start to collapse. At this point resources have been drained almost to maximum, the system has lost all reserves, and so death will result as famine and service cuts result.

So 2040 is about where the human race starts to die.

And it's funny, that's always been the magic year for LTG analysis and yet for *me* 2025 has always seemed much more important. It's in 2025 we first see the inversion of industrial output and food per capita, with services still about 5 years off from the start of their decline. At this point resources are in heavy fall, births are in decline, but the peak of pollution is still quite far away. And I have always found it revelatory that industry and food would fall at the same time; we have turned food into an industry after all, and food production into manufacturing. Factory farms and factory slaughterhouses are the same thing as factory anything now.

More confusing to my way of thinking is to say services will persist beyond food and manufacturing – this used to seem counterintuitive to me. At their core services provide food and industrial output don't they? And any physician will tell you they're mostly useless without equipment. See what's happening in Gaza now as a good illustration of this. But recently I've come to realize that finance is a service, and given how much more money there is in finance than anything else…yeah I can see services 'persisting' longer. We'll be trading bitcoin between enclaves while masses starve.

Speaking of; the delay between the drop in food production and population has also always stood out. In scenario 2 for example food production has dropped for 30 years before population starts to actually fall – seeming to suggest a period of less availability but still more than enough to keep birth rates outpacing death rates. I guess this makes sense. We do grow more than enough food now and can surely stretch calories more than we do. But for 30 years? LTG seems to suggest we could drop food to ½ the amount per capita we had in 1950 before famines start en masse, and that seems…very generous to my eyes.

To make better sense of the Limits, many have compared the modern world to its predictions. Let's do the same.

In 2025 industrial output has begun to show signs of flickering from normal. Overcapacity in China has been the investment term for the last 18 months, with a constant devaluation occurring in both Chinese goods as well as its property sector. Manufacturing CPI has bounced up and down around .50 with contractions slightly outnumbering expansions. This scenario hasn't occurred before in China outside of a small period of COVID and that seems revelatory. It's not that raw materials aren't available either (though there are some concerns primarily around rare earth items) – it appears to be that inflation is tamping demand in some markets, that trade warfare is growing and making markets shift, and that the pure amount of investment money in the world is making it very difficult to separate corporate reality from investment hype. Companies that produce the same amount of goods from year to year (like Nvidia until 2023) suddenly see 10x valuations without anything approaching 10x increase in sales. Likewise a company like Baidu might try to raise capital by building more factories, and yet not have immediate plans to build many more items. Apparently just having the factories brings more investment dollars, all chasing the potential.

What happens when companies expand for potential that does not materialize? Well they over expand. I think this fits the Limits to Growth very well – after all what would industrial output look like *just before* it failed? Empty factories of course, or factories only sometimes used. Workers paid part-time (like at Boeing now) because there aren't enough orders or supplies. A mismatch between what a company plans for its future versus what the market actually wants to consume. Investors chasing growth in an increasing frenzy over diminishing return opportunities. The first trillion-dollar company was Apple in 2018. There are now 9 of them.

Interestingly food production has been flickering since 2020 at least, and for some crops started to fail as we discussed. 2020 is also the first return of declared famine

for a period of years, and it has been steadily expanding every year since. I haven't seen a good per capita estimate for food however as most open sources on both capita and food production are 5+ years out of date. How bad is it when our data is owned, and we can't tell if there's something scary ahead because we can't see raw numbers?

Resources can be desperately hard to measure, and may be an area in which the Limits to Growth modelling did somewhat fail. Some examples: oil reserves on earth remain firmly strong and growing. Yes the 'easy to get oil' has long since been tapped, and if we use EROI (which IS a resource) then we have dropped steadily from 1960 to 2000. But oil shales and new reserves both on and offshore have meant we won't be running out of oil itself, and we still have low hanging fruit available in the form of nuclear and sun power, so I will consider all those possibilities together (unlike getting stuck on EROI as lots of analyses do). Likewise many rare earth deposits have been found, its just that scaling up production would mean decades more increases in CO2. Quite unfortunately for any green economy narratives, there is simply no way to mine and manufacturer enough of these to transition away from oil, let alone in five years. We're stuck with oil til the end, and after. I would say resources are actually stable or growing, at least when taken as a whole.

Biological resources on the other hand are collapsing actively as we've covered. Sad, but only tribal societies seemed to value these, so here we are.

Pollution is another metric I might rate as unclear or stable. Shockingly we've generally done *better* than LTG models, with neither CO2 nor general trash metrics quite what was anticipated. But here I think there is a definite blind spot – chemical and 'incidental' pollution. It's one thing to say greenhouse gases should all be treated the same, I understand that for simplicity sake, however the compounding and combining nature of chemicals, of micro plastics, of the disruptors of body itself were not tracked by LTG. DDT was of importance in 1970 and the ozone hole being discussed so this is a full failure. If we try to map them to this model though, I think we can safely say we're at least matching their expected rise in pollution.

Which does bring us to deaths, and definitely an even muddier picture. As of 2025 there are no strong AND peer-reviewed signs of worldwide drops in population, and yet there are many strong signs of flickering. In the US for example excess deaths seem easy to blame on COVID and so outside LTG's purview, and yet the reality is deaths were growing before 2020 and are only increasing in 2024 and 2025. Likewise countries like South Korea, Russia, Japan and China are all actively shrinking and have been for several years. Given the state of census taking and publishing in the world I have no doubt that when population does peak we won't know about it for 4+ years. Is that soon though? I don't see signs of enough deaths yet to point to a real fall, so no.

Conversely we're doing demonstrably worse on births, collapsing with a noted acceleration even in 2024 and 2025. The LTG does model some steeper falls in births but nothing like we're currently seeing. This may be a complex artifact that the LTG papers over, or else maybe there is a complication occurring – something

like the interplay between falling standards of living due to inflation/costs and the digital age.

So where do we end up in my estimates?

Resources	Stable materials Collapsing ecology
Births	Collapsing
Deaths	Stable internationally
Population	Some flickering but regional
Food	Flickering
Services	Stable (AI disruption is coming though)
Industrial	Flickering
Pollution	CO2 is accelerating still Chemical pollution is flickering minimum

This is a mixed picture for sure, but I think it accurately 'maps' LTG to 2025.

But does it capture everything of Earth?

Improving the model

LTG appears to me to be primarily about trajectories for *things* (Food, services, Industrial output, pollution, resources, population), with a few metrics for *actions that are also things* (deaths, births). What I don't see a lot of is explicit relationships between things, how does pollution drop output? I know the supplemental material explains this sort of thing, and we could easily get into the weeds, but let's look up and not down here. Let's assume some relationships are covered, and some can be inferred, but what about ones that are missing? We should try to add those. And likewise please note that the LTGs very accurately tell us when trends will happen, but fail completely to tell us what it might be *like* to live in each of its moments. We can see rise and falls yes, but we don't see how people are responding to falling output, and general human drivers and actions are considered as unimportant compared to the trajectories of *things*. Even births and deaths are events we never individually remember.

Given how much of the human experience is our connections to each other, this seems a potential blind spot to me. Do we imagine a death cult society like the Aztecs might go through LTG on the same general trajectory as a peaceful Polynesian island society? LTG scales large enough that we normalize everyone to a curve but I would ask should any curve, even on a planetary scale, be THAT smooth? What if everyone on earth did join an Aztecs cult before the end? Would the math hold?

The intention in 1970 was to map the reality of their day forward in time, and so I say let's map todays drivers a little more than the first attempt. And let's be strategic about it.

We want to know how useful this model is today right? We want to know what it can teach us (how it could be applied) but also where it fails and we might do better. Given how many trendlines in this document have already suggested independent

‘fatal points’ ie mass death between 2040 and 2060, which *already* matches prediction in BAU in both form and function (ie, not just mass deaths in 2040, but mass deaths DUE to rising pollution + falling output) I myself am immediately interested in the years preceding that. Yes, we need to confirm that 2040 or collapse are both things, do they even happen? Is it later? But what if it’s earlier? And since earlier is NOW…

Well I would like to know what the collapse suggested in LTG *looks like*.

And a warning, because in 1970 production of everything is going up, and pollution is fairly tame, I think they weren’t too focused on the individual lived experience. I am. And since their world isn’t our world now, there **will** be differences.

How do we figure out those differences though? Well, as a spot, LTG seems to suggest that pollution drives deaths, but aren’t there other things that drives death? Where’s the war in LTG? Would a WW3 change the equation? And all these smooth lines - where is the mapping to chaos? The steep jumps that happen with shifting systems? I said it before but it bears repeating, LTG is too smooth. Even for a simplified view of a system, we have to anticipate the reality of chaos. Yes, simplify to model sure, but let’s make sure we’ve got a variable that adds some chaos back in – because chaos is reality.

So what’s a simple version of chaos we can use now? Acceleration or deceleration I think, and the concept of system changes. If we’ve got curves, then at some point they should misbehave or show abrupt regime shifts. We have a bit of this, there are some peaks, but we need more. We also likely need to track more items that show connections between our existing plots. So what do we choose?

I’m going to suggest we look for drivers – items that influence our existing metrics but tell us ‘how they will behave.’ For example the economy drives economic output. Seems simple yes? But of course you could have war time economy, where nations are piling up debt to drive output, or you could have a boom economy, where some new efficiency means everyone is getting richer, even the government, and both could yet create an economic output graph that looks the same. But they would be very different to live through no?

Likewise what is going to stop or speed up pollution? Government might do it, with more governments focusing on short term game doing one things, versus say an actual and effective green party in power. And different governments can be very different to live under.

So let’s go choose some new strands for our lived LTG.

What about Health or Wellness I immediately think? Not just what is the population doing in terms of life and death, but HOW is it doing? Is it happy or sick? Do you know that you can have a sick population that is generally growing? You can also have a happy population that’s shrinking (think the Nordic countries today)! If we assess general worldwide wellness today, what we might call HLY (healthy life years) we’ve seen plummeting numbers since before even COVID. It’s not just the micro plastics, the PFOS, or the inequality, it’s also cancer in youth, autism, anxiety and mental health disorders. In the US the life expectancy has fallen nearly every

year since 2020 yes, but many other countries have also plateaued, and all while population is apparently growing. This is flickering at minimum and collapsing mental health, should we ever want to tease that spaghetti out further.

Cognition is something that the LTG didn't even think of assessing, and who could blame them? Well I can. Unfortunately, anyone in healthcare understands there is no difference between body and mind, and if pollution's main mechanism of mortality is causing bodily harm…well that will affect the brain's functioning as well. And probably for years before death. And rather than just general wellness or mood, I'd actually like to focus on an assumption of the original LTG – that humans will be the same in 2040 as they were in 1970. Why did they assume this? Were humans in 1970 the same as those in 1870? I think vaccinations and laboratories might have something to say about that. So what about our brains compared to 1970? Are we smarter than we were? Stupider? Today we have plummeting test scores worldwide, increased difficulty functioning and a timer of micro plastics. Yes, there's more education, but the substrate of the brain is under assault. I'm not sure an efficiency gain in some is overwhelming the loss of efficiency in all. This is collapsing, and at a time when we will most need to come up with clever solutions.

We mentioned governance, so let's consider that too. Government is the primary metric by which we tend to regulate human behavior and thus in a complex system probably an early indicator of stress. And in this regard, government is collapsing. It is not just the multiple newly failed states we discussed earlier, but also the pure amount of governments gridlocked for years at a time now. Legislatures that don't pass laws, parliament houses divided by only a few seats election after election, upsets of established parties, the discarding of norms and the return of populism and anti-immigration, all of these point to government systems not just under stress but actively retreating into doubling-down, appeals to tradition., or simple scapegoating rather than complicated adaptation. Less new solutions *is* a feedback look when you're confront with more net changes.

Infrastructure – I have wondered if infrastructure in the original LTG isn't covered by a combination of output & pollution. After all, what separates a car from 'tool' and 'pollution'? It technically *does* both, from the moment it's sold. However, I do think we need to realize how much stuff we have that is working actively. IE, if work is the primary measurement of so much, the tools to perform that work must be important and continuous, not just used once and tossed away (can't do that to a power plant, right?). If all the power goes off tomorrow worldwide, well pollution and output are both dropping at the same time right? Infrastructure is the measurement then of the how many goods and services are current working for now and this means, unlike output, that some infrastructure can be a thousand years old and still be counted as 'part of the active pool'. Interestingly with this metric we get to answer a bit about 'what is it like after 2100' in LTG. Think about it – in LTG there is a population 'after' the collapse, so what are they doing? Well they can't be cavemen, because there will still be infrastructure. Will every city be destroyed? Will every car? And even if they all are, I'm positive not every book will be destroyed. Neither will every mineshaft, generator and already manufactured cpu. Likewise IF these things were all destroyed, well that would change the graph too, wouldn't it? So where are we with infrastructure today? Here a strange thing does

show, another common year – 1970. At almost the same time as LTG was being made, the last generators to be built in Cuba were being made. With 30 year expected life spans. I was astounded when I found out the same metrics hold (broadly) true for Russia, a number of US states, South Africa (large sections of Africa in fact), and many other countries. Likewise there hasn't been a federal expansion of highway systems in many countries since the 1960s. Power is turning off more and more in more countries and YET, infrastructure output *is* rising. We are putting more satellites into the sky than ever, and STARLINK is going to coat us all in internet. So this is at worst flickering, with some old bridges falling down even as 5G is spread out worldwide.

Finally the last metric I might add is inequality. This metric is the most complex of all, but at its core I think it *needs* to be tracked – the reason being that it is an accelerant. Think of it this way, if your family is starving and children are dying we would likely classify your family in a state of collapse yes? But maybe we wouldn't rate your society in collapse, especially if this was…well the plan, according to your king. And maybe a hundred families could suffer and be failing, while another 100 families are succeeding in luxury, and the overall picture is of balance – even for both sides. But what if 99 families are starving, and only 1 is succeeding, but that family has enough resources for all 100? How do we rate this? An averaged amount is not enough; we also need to consider distribution. Just like having sufficient minerals in the ground doesn't make resources 'stable' alone, having wealth in the world for everyone doesn't matter if it's not all accessible. And from this metric…well, we've been collapsing for decades. The LTG never anticipated that we'd return to historic levels of inequality, and yet we've done so, making populations significantly more brittle than even the poverty of the 1970s. Yes, general wealth increased, but average pay? Worldwide it has barely moved since 1970 relative to inflation and in the last 5 years it has dropped in many places. That's a regression of capacity, even if there are trillionaires on the way.

Final score:

Health/Wellness	Flickering/Collapsing
Cognition	Collapsing
Governance	Collapsing
Infrastructure	Flickering
Inequality	Collapsing

Last thoughts

I did not choose my additions purely to add 'collapsing' a lot. I chose what I viewed as 'systems that control other systems.' LTG is spaghetti logic and so we needed noodles that pull other noodles.

So what does LTG look like on the ground?

More pollution = more people sick. The model doesn't say it, but we do understand that. Likewise less resources = more war, how much war we might argue, but surely conflict rises yes? So stress appears in one system even before another system has completely or even partially changed. Before pollution reached its peak

in LTG resources plummeted, and now we can see that infrastructure (some of it) might persist. But cognition and wellness, we'd expect them to drop much sooner than population.

That's what we see with these additional metrics, the connections that might flicker or move before the ones that rely on them. Governance > Population, because you can't have a government without population. And in our version of 2040? That's not just 'we start to die then'. That is 'people who have been sick and poor and unable to think living in shitty situations with no government' start to suffer so much they cannot have babies that survive.

And by those metrics our problems don't start at 2040. They don't even start at 2030. They started when the first strand in our ball started to flicker, and pull on other strands. It started when one of the strands wasn't flickering at all, but falling, and that action causes connected strands to flicker and fall too.

Of course a system can absorb a certain amount of this, but please look at what we have here.

Only 3/8 of the original metrics of LTG are stable. That's less than half the measured systems. Likewise ALL of my metrics (those that precede LTG things) are either flickering or collapsing. If we see chaos everywhere now – <u>that</u> is what the LTG looks like before 2040.

Combinations

We have now reached the part of the presentation when the wheels start coming off. Not of the plane mind you, but the human race. Yes that's right, it still gets worse. I promised you a theory, not comfort.

So far I've demonstrated a whole number of crises in action that to be frank a lot of other people have seen too. Our synthesis might be slightly wider in scope than single-topic conclusions and we've added some strange heuristic, but not much beyond that right? So let's go wider.

Now let me demonstrate why we're using a heuristic at all, and not say working on a formalized model to quantify the degrees of bias.

Remember me railing at models?

I have mentioned aerosols being misunderstood, and microplastics building up in brains, and food inflation threatening a return to hunger. We've identified problems in a multitude of human and earth and ecological systems. We have even hinted that many of these problems are interconnected, feeding into each other.

But have you considered how they might combine? What is it like when someone who has pfos in their blood, and micro plastic in their brain, and food that is not nutritious enough, and a semaglutide prescription that is in a shortage, tries to breathe in wildfire smoke? In medicine we call this synergistic toxicity. IE, someone who has had an overdose of a number of drugs at once.

Or put another way, how much worse is the flood when you've had a drought for six months, the crops are just 3 weeks to harvest, and you are overextended on debt?

There is an organization called EU SOLUTIONS (note: The EU SOLUTIONS project has 'products'. I love it. Isn't that great? The project to identify an infinite problem is called a solution, and then they make a product, like they're a company. Like we must consume) that has made the startling realization that a combination of pollutants appears to degrade an environment much faster than just one of them. And that it does so in unpredictable ways.

Makes sense no? Infinite diversity arises from infinite combination. The more factors you have, the more possible permutations of a problem exist.

And that's what we're talking about here – one world, how many problems so far? 40? 50 at least?

Even now there are more wars in the world that any time in the last decade. Also more famines, higher prices, more government and personal debt, more pollution, and hotter temperatures. Records are being set in a dozen different places and I don't have to list them, because you can literally find them anywhere.

How many of these events do you think are connected?

As of this writing hundreds of federal marines are being sent to a city that just experienced its worst natural disaster. These marines are being ordered by a

controversial populist in an attempt to deport individuals who came to this country often fleeing prolonged droughts in their own countries.

As of this writing a second ‘once in a lifetime but really just this year’ series of floods have hit NSW’s coast, while 300 kilometers away in the same state a drought of 22 months continues to force farmers to cull sheep and cattle into a market disrupted by trade wars and supply-driven inflation.

In just 2 years Kangaroo Island has 40% burnt down, suffered another bee hive collapse, and is now surrounded by an anoxic algae bloom that is killing all seabed life and sickening island inhabitants.

These are synergistic multi-causes crisis, and there is only one level of event above these.

You’ve noticed by now that there’s a lot of ‘I don’t know’ in singular subjects. We don’t know how many or how strong soil feedbacks are. We don’t really know how much methane hydrate there is, and where it is. So now I ask you, how do you assess if soil feedbacks underwater destabilize methane hydrates? Where do you go for that? And if we want to know how micro plastics interact with that soil suspended hydrate?

I can already hear the chorus.

But if we want to know we have to integrate micro plastics, methane hydrates and soil! And to do that, we need a working model of each of these! That’s why we need experts, that’s why we need to really *drill* down and understand them each. To understand their addition!

And to this I say – you have spent so long perfecting your models you have missed that the species of bird your friend is studying is dead.

You have studied hydrates for so long you missed that the water it was in is heating up.

You have not looked up from your model. You have tinkered with it, turned it over, worked on it over and over like a master woodcarver and completely missed the reason for carving at all.

World models are hard, I understand this. They are horribly complex, infinitely so I just said. But that doesn’t mean we mustn’t do them. In fact I might argue we should do THEM most of all. Studying one thing is easy, but studying all of them?

What we’ve done in our age is make 100,000 experts and almost no one who can talk to them all. We have domain siloed the hard thinkers and then put the ignorant in charge of governments. Not people who ‘understand some of it all,’ but instead none of it all.

And so where is the space for those synthesizing a large view? I don’t know, because I can’t see it.

That's what the whole human race has done. Blinded ourselves. We've become so self-assured of our places we took them for granted and said, there's plenty of time to study everything, we'll look *there* later.

Humans are not meant to think about 40 things at once, I get that. My mind fumbles horribly with everything I've written, and I'm sure you've seen the errors. But I'm hoping against hope that you might have looked long enough to see the pattern more than the noise. And the pattern is *there*. Even with all my errors I stitched together a picture I just do not see at scale.

Cross-domain synthesis has given me sight that too many of you lack, and this is why a heuristic. If I tried to formalize, tried to reduce all of this to a mathematical principle? I would fail. It cannot be done by a human mind. But whereas others abdicate possibility, I say, do what we can.

Because we are about to kill everything on our world and if THAT is the answer to why we do things, freedom to destroy blindly, then we aren't just myopic. We are actively stupid.

A heuristic is an acknowledgement we lack capacity yes, but also an acknowledgement that capacity might be possible, and that until we find it we will need as strong an algorithm as we can to explore as much as possible. To not reduce down until we know how one thing works, but to keep looking up until that thing makes sense alongside us.

We are wasting time with only one approach, and now I need to tell you there is no time left.

I don't believe science has done poor work in and of itself, not at all. I dismiss religion and belief, and I think science has been a great tool. But we use it like children. The heuristic I have been using has allowed for predictive capability entirely because it marries the concept of the strengths of science with the weaknesses of the people wielding it. We are compensating for the human race and picking up empirical science again with that understanding.

When a paper says something, assume it's being very conservative.

If someone says they know something, doubt them. Doubt *everything* but especially doubt them.

Do not rely on models and every time you use a model, pull it into the bigger world until it doesn't make sense. Hell, ask yourself, is this even the best use of my time as a paragon of Earth? Be strategic in your thinking, not tactical.

Be sloppy when necessary to think larger, because the reality is everyone is being sloppy NOW and just not seeing their mistakes.

A heuristics approach II

Did you know the heuristic approach has a precedence? I think it might be useful to do a history dive for once, so that I can demonstrate both that strategic thinking can do a few things tactical cannot.

But while there are many strong examples that exist of institutions themselves causing a problem and refusing to see it (Sammelweiss and fever) or of risk that is *there* but often unseen (Reagan and *Wargames)*, I also don't need to make every connection for you – you should go looking yourself. So why don't we limit ourselves to one example, something that demonstrates both heuristical application to what is generally a 'fine-tooth comb' practice, AND where bias was rampant and actively contributed to (deadly) problems.

Tell me, do you know the story of Andrei Chikatilo?

The short version of this story is that a series of violent and similar homicides were happening in the Soviet Union toward the end of the cold war. The authorities there however were quite convinced these murders had no link – after all serial killers were a western conceit, a trope to put into movies or a consequence of societal decadence, and not at all possible in the USSR.

Luckily for everyone, one investigator on the investigations grew so concerned over the crimes that entirely on his own he reached out to American professionals and made a request, could they take a look at what was happening in his country and see if they saw a pattern?

And of course with the right eyes one was quickly found, not just of homicides and violent rapes, but also of brazen knife attacks on crowded trains. A picture that grew to include a criminal who revisited previous homicides and often just let bodies lay out in the open. Of a mind so unconcerned with getting caught that often he struck in the middle of the day or with many witnesses around.

From these recorded behaviors a profile was created and predictions made to the local authorities: the killer would be male, he would be 40s or older, he would be a professional of some kind. And while there were actually many more predictions to this profile, some accurate some not, the most important piece was just that the man had probably been arrested previously. IE, *he would already be known to the police.*

This last prediction not only turned out to be true, it led straight to a man name Andrei C who was arrested (again) and finally had the crimes he committed pinned to his name. Of interest many Soviet officials continued to deny Andrei C was the killer or that he was anything more than a 'once off' fluke right up until his execution. These men were quite convinced that what had happened simply couldn't have been.

Amongst the American professionals who helped with the case were members of an FBI division known as ViCAP. And it was a profiling technique created with their help that led to Andrei's arrest.

And what is a profile? It is an advanced heuristic.

To explain - most investigation is deterministic. Sherlock Holmes crawls over the exact scene and adds what he finds with witness circumstances into a single crime with puzzle-like perfection.

ViCAP on the hand, was formed with the 80s advent of databases and the realization that someday statistical analysis could be performed to capture criminals instantly, BUT that while the database was being perfected, results might still be able to gleaned from pattern recognition. Or to put it another way, they dreamt of a crime-fighting computer, but why wait? Why couldn't they do some good while they were building it?

In preparation for the project of a national database, ViCAP and the FBI (intelligently) started by bringing in psychologists and psychiatrists to help study criminal thought, as well as criminologists, detectives, field agents and computer scientists. And (no shit) a few true crime novelists as well. This multi-discipline approach helped create the very concept of a profile. And driven by a desire to save lives (and their unified desire to debunk psychics still in use all over the place), profiling was immediately applied.

Why? Because if many criminals shared statistical similarities, then maybe instead of waiting to understand those perturbations precisely, murders could be prevented NOW by some clever application. Maybe ViCAP couldn't find the exact criminal yet, but with what they already knew maybe they could take 1000 suspects and narrow it down to 20. This would help the police find their man faster and *save lives*.

Or maybe catch individuals who never would have been caught at all.

Did ViCAP think their process would work all the time? Of course not. But maybe the idea could work enough of the time to be useful? They decided to try to see.

95% is the first confidence interval in most science, but the loose number I have seen mentioned a few times for those early days of ViCAP was 80%. That was the goal they had. Could these professional investigators create a fast method of identifying criminals 80% of the time? Yes, there would be errors. Yes 1 out of 5 times they might point law enforcement in the wrong direction or miss their mark entirely. But the rest of the time - well considering these were unsolved cases, isn't 80% better than 0%?

An example of application:

There is an unknown criminal in Seattle. He is paying prostitutes for sex and then taking them somewhere just outside of the city and murdering them. He then dumps their bodies in forested riverside locations, which he does seem to come back to at times. He drives a truck, is unassuming, and has intimate knowledge of the entire I-5 corridor. But no one knows who he is, and he's been successfully hiding for a *decade*.

ViCAP looked at this situation and determined not only is this killer likely white, and middle-aged, he will have anger issues. That means a history of contact with the police and maybe even a criminal record. He'll be a professional, but never a high

ranking one, and will have gone long periods of time without employment (because he keeps roaming and revisiting). He'll have training in engineering or electrical work or something similar. And because he keeps dumping the bodies at river settings, and coming back, he's going to live somewhere rural, or at least not in a downtown proper. And because of his target type and prowling behavior, he'll likely be well known to the prostitute community. He's comfortable with them you see, a regular.

This is abductive reasoning. With only a few firm facts, nonetheless patterns can be both spotted and assumed before they can be confirmed.

And wouldn't you know it, Gary Ridgway was indeed a general fit for the profile ViCAP made for him.

But an interesting thing did happen to ViCAP when they made their profile to the Seattle PD, just as it had happened to that smart lone investigator in the USSR.

The Seattle police department in large part rejected the profile, and accused ViCAP of being unprofessional.

The reasons were (in retrospect now) quite ludicrous. You see to make their profile ViCAP had talked to local prostitutes, which Seattle PD accused of lying. Likewise, the Seattle cops resisted the concept of being able to predict or profile a killer at all, saying what ViCAP had done was just 'guesswork' and that only true detective work was going to find the killer. But then of course (quite predictably), it came out that Ridgway HAD been arrested previously, and had been let go by the Seattle PD for being 'too normal.'

Just like in Russia a killer was right there with the detectives the entire time, but not one of them could see him. They were biased against the possibility that someone could have killed 48 women in their own backyard (Seattle PD thought there were multiple killers, and never just one). And they were biased that the prostitutes in town were telling the truth. They were even biased with the idea a killer could have a college degree, or speak normally, or just be…a human.

This was an institutional reality ViCAP encountered again and again in their work. In order to find killers, ViCAP helped to study these individuals. Investigators made special trips to talk to killers in prison, to build trust with them, to get gory details from them in order to find out 'why they were that way.' This led to scenarios like an imprisoned killer helping to catch another active killer, and how does a reward/punishment society handle that? It's a non-binary situation!

With a little work it was soon the FBI's general conclusion that making a criminal was actually quite easy and mundane. Treat a child poorly, raise him in poverty or hunger, abuse him sexually or with violence, and then repress him as he grows up, and you have a very good formula for a possible violent offender. Does it fit everyone? No. But does it happen more often than random chance? Absolutely. And perhaps logically the FBI then found these individuals could be found almost anywhere. White, professional, religious, even politicians and fire chiefs can secretly be serial killers and arsonists. Rather than 'singular or rare', killers were in fact almost statistically predictable.

And people have never liked to hear this.

John Wayne Gacy could not be a killer, he was well liked, married, and a church leader! He even dressed up as a clown. There can't actually be a killer clown!

Ted Bundy was too charming to be a killer. Too smart. He even ran for political office.

A father and son could not be killing partners – Truth or Consequences was just too small a New Mexico town to have anything like that happening there.

Profiling wasn't real police work was (and is) a repeated refrain. It was guessing. It was feds showing up from out of town to use big words and intimidate the local cops and try to solve in a week what had taken them 10 years so far. It wasn't disciplined, it wasn't precise, it wasn't *real*.

I have gone back to my notes and memories of ViCAP many times while unravelling what I've seen before me in this document. The parallels are astounding. ViCAP's exact profiling methods are a heuristic of sorts (much more advanced than mine yes – but still intentionally NOT a firm formulaic process), applied to great effect to find murders that were happening in plain sight. And again and again the FBI encountered institutions, professionals, experts who simply *would not see*.

All while death happened right there in their own backyards.

And please, I invite you, look at the connections and predictions we're making right here together. Look at the datapoints assembled for you. This isn't just general statements, but an overall picture filled with concrete facts and points of failure. The whiteboard's predictions are right there. I'm certain of failed states and economic crashes, just as I'm certain methane hydrates are firing now and will fire en masse soon, and will be observable when they do. As micro plastics rise, so will autism, and not because the micro plastics definitely cause autism, but because the systems of overshoot and institutional impotence are directly linked.

Like ViCAP I am not going to tell you where every single killer is.

But I am telling you there are killers out and about that are active and currently unseen. And they are getting worse in a predictable, and yes almost boring fashion.

- Like ViCAP you and I need to investigate every source of info – prostitutes/killers/Cops/Victims

- We will use psychology, statistics, tradition, computer science, climatology anything to see what's happening – multi-domain

- We will listen to the experts, we will use their data, but we will also question them if we find a different answer – existing science method is good, people and application are not. Point out to the cops where they are wrong

- We will not let perfect get in the way of good. Yes, some of my facts are bad,

but the *pattern* isn't. People are dying right now – 80% is better than missing a killer

- We will fight institutional bias in ourselves and others – Killers can be boring. They can be 'ordinary people.' They can be right here right now

- We do not know everything and must keep learning – update your profile

- We WILL apply our heuristic though, and will make specific predictions to be verified – make the profile, find the killer, then recheck the profile and update the process

Our time together is almost done now. I hope you're paying attention and can apply this process yourself.

2030

(Note: I don't like 2030 as well…anything. It has no significance to me and the particular year nor number don't have any importance. Nothing specific happens in 2030, but I did think making predictions for the next five years is useful and from 2025 that puts us…at 2030. There is no single threshold crossed in 2030, and it isn't too terribly different than the years before or after. The rate of change is big around then sure, and accelerating, but that's just how every year will be now.

Using 2030 at all is more instead saying, if we're likely most dead by 2040 according to LTG then what happens before death. It's easy to say things will be worse than we think, but what does that look like? If there's something we're avoiding thinking about, that we have a bias towards, what does it look like when we remove that bias? What if we refuse to be afraid of our numbers and look right at the future they promise? 2030 is the road to collapse, and you are on the road.)

So here we are at the last bit, we've made it, we're there. If we have talked about the heuristics now, assessed the world through their lens, then we should also be able to apply those heuristics to guess what comes next yes? If it's useful to us, shouldn't it give us some useful predictions?

These will be like my whiteboard example earlier. We should be able to repeat that easily enough I think. We can really put me (and them) to the test, because if the heuristic is generally applicable then…well it should be generally applicable. So let's apply it.

But a couple of notes before we do.

First off I hope it's clear by now that we shouldn't be caught up on a particular system or point or year. We are not going to hold onto any one thing as true or as the 'causal factor', beyond of course the bias. The whole thing we're doing here is a systems analysis built from taking modern data and just correcting our assumptions about them and so we should already understand collapse isn't a year, or a single event, or even a single set of relationships.

To put it most plainly we're not about to predict collapse: we are already in collapse.

The collapse has already begun.

We know marine heatwaves likely started to appear around 2009. And that insect populations were plummeting in 1999. It seems Exon Valdez anticipated 5C of warming in 1970. And in 2023 for some reason the readings on ocean temps jumped up. But none of these is a collapse in and of itself; they're just system fluctuations. A 'worldwide collapse' is just a way of saying multi-systems all undergoing collapse from previous stability at once. And by that definition, this whole document has been showing you that we're in a multi-system collapse right now.

And we have been for a while! Heck, the whole reason LTG was able to predict what's happening is that they use 'Business as Usual' assumptions, ie they just

followed trend lines from right then! Nothing had to change from 1970 to get to ‘today’, they just had to continue.

How wild is that? Have you realized it previously? LTG is just smooth lines from 1970 to right now.

Once that’s digested, let me now point out that collapse doesn’t really work like that either. Cascade collapses are non-linear, and driven by accelerating accelerants, which means at some point those smooth lines stop being smooth. But that’s what this section is, us looking together and seeing, cataloguing the wave we’re riding.

My second note – please remember ViCAP and 80%. I know a heuristic isn’t formulized, mathematically precise or hell even the best way to perform a correction. I’m not aiming for the *best* though, I’m aiming for fast and still accurate enough to be useful. 80% is also my target, and not my guarantee. I’m not smart enough to get specific on this many variables, but at least I’m attempting it. I am putting in rigor but we’re not in research here, we’re in triage. It’s time to act like it.

Third and final note – You can do this. You should do this too, and often. Science is our basis and everything should come from a place of empiricism, but remember science is supposed to be a tool. It is not supposed to have gatekeeping; it is supposed to have verification. So question everything, confront your bias, look at a problem and predict. You actually have a lot more biases and there’s a lot more correction to be done, but that will have to wait for now. One problem at a time.

<u>The heuristic applied – Predictions</u>

It’s very easy to just say ‘everything will be worse’ going forward. If I’m right about even half of this document and an earth system cascade is in progress, then that really is all there is to it so far as our old world goes. But I think it’s very important to walk through reality, step by step, and see what we’re about to do. Acknowledge the fuckups. Maybe even some precision back into the mix just as we try to look wider.

So yes things get worse, but we’ll still be getting some surprises too. Our lines won’t be smooth. Hopefully this means some things will get better, ie, systems will show some surprising amount of resilience or not be quite as strongly linked as we might expect. I for one think that the main crops corn/wheat/soy (not rice though) can probably still be grown at scale for a long while to come. There will be disruptions to them, entire breadbaskets under stress, but actual net production? Yeah we’ll be able to do that for five years or so at least I bet, and likely even more.

But this *is* a systems collapse so while maybe we can keep growing due to excellent farmers, the trucks and the power and markets likely fail and it won’t matter if there’s food in the fields when no one can access it.

And since each new failure has the potential to cause additional failures, we’re going to get compounding problems. Combinations.

And this is why I talk about ‘2030’. In our previous review we noticed a fair number of trend lines converging around 2040 - 2060. You’ll remember that was important in the original LTG BAU as well. But that was primary systems only, and my theory

has always been that it's worse than we think. So while micro plastics alone might not kill folks until 2040 or later, 10% of us sick combined with ½ the oceans too acidic and .05% hydrates firing probably CAN kill us, when combined.

Years before one thing kills us, many things together will. We're not doing our sums but let's make some predictions along these lines and in a few years we can see if I'm right, yes?

That's supposed to be 'good science.'

And one last friendly bit of advice; don't read these in one go. Take them in bites and do other things, and only come back when you're ready.

- I have often encountered the idea of the first 'domino' to fall, or the expectation that some system is going to fail first in a big obvious way before real chaos sets in. The stock market is going to crater to nothing, there will be a run on oil worse than 1970s, congress will be dissolved or marshal law declared. I assert this expectation is conservative bias – the mind saying no giant event has occurred so everything right now is fine. I deny this version of unravelling and while I think all those events will occur, I don't really think the earth and human systems need a complete breadbasket disaster or worldwide power outage for a cascade to failure. No single new system needs to fail entirely, because *so many* have failed in part already. Animal life is almost gone now (30% of 1970s already tiny numbers remain), hospitals worldwide are in active collapse, excess deaths are growing, Africa has less power generation than 15 years ago (so it's now peak power), public research has been gutted. To be frank the world has *already* shifted, we just haven't pieced the picture together. The oil well that only needed to go down 20 feet to power half a city is already extinct. So are 200lb fish in the Chesapeake Bay, gold nuggets just waiting on the ground, corporate pension funds, and small issue rich elections. And being married to any certain series of events that happen next, or a specific order from them, is trying to do more specific forecasting than I am now without accounting for even 1/10 the items. Consider, if New York loses power first, the Dow Jones may not have a hard crash. If the internet goes down first you may not ever know if London flooded. Don't get me wrong I DO believe there are predictable specific events coming (obviously), but we must make way for both chaos and our ignorance. So this prediction is that there is almost no lynchpin event we MUST expect – the methane hydrates might not fire at scale, the micro plastics might not be a problem in time, food might be available right up until the end, all because a broad multi-national war breaks out first. And please remember, it is not that a system needs to 'completely end' for cascades to erupt from its husk. 20% failure of the AMOC might be called AMOC failure, but in actuality I don't think most models ever expect the AMOC to cease. It's just that a 20% failure already shifts vital weather patterns, just as 1.5C seems a small change and yet shifts *everything*. By this metric then, many dominos have already fallen, and now we are simply waiting for the entire room of them to tip. Like the LTG we're waiting for most things to crash, not all.

- Human societies have a 'believe what you want' crisis growing. IE, information as a commodity has grown is now the primary businesses domain and as governance there has steadily retreated, the field has grown wild. This is part of why the bias is

everywhere – we have the information but we didn't tame it for a purpose. Science is questioned (but unlike us they do it unreasonably, as a reaction), facts not even sought, and thinking turned shallow to the point that article size and sophistication in printed language has been measurably dropping since 1980. All of this is generally known - what's NOT known is that this process is going to be *irreversible at scale*. A value statement for governments is that we have them so they can create movement at scale in order to effectively deal with crises, and yet this document has laid out this is no longer true. The future will only exacerbate this problem and as our crises compound our heuristic governments are mostly going to default to faster, simpler, less accurate interventions and assessments. Worse I'm going to suggest we will actually create additional problems with current governance – rather than identify our difficulties many governments world-wide will destroy our information-finding apparatuses. There will be no reversal of complexity decay and effective re-scaling of organizations like NOAA, even when regime changes allow a temporary 're-opening'. Instead overall government actions will be towards less data > more focused actions on 'tentpole' problems. If analyzed as a statistical field I think we'll find that throughout the descent to 2030 and beyond, government turnover would be historically high and ever increasing. Likewise analysis of news media would find a decreasing level of complexity, with even 'sophisticated' articles and deep dives maintaining silos and limited synthesis. Our picture of the world will generally simplify, missing even current levels of connection, and the decay will track almost side by side with the Flynn effect reversal.

- micro plastics will rise at an accelerating exponential, and will be further attached to nearly every biological process/disease. This is not because they 'cause' everything, but simply because they are everywhere – the levels in our study were all independent of age of host, which means that it is the plastic itself that's rising and this tide will have to be compensated for. The reviews we do over the next few years will find plastics are already contributing to diseases today yes, but we will find specific plant and human thresholds beyond which the plastics cause disease too. Worse we will find not all fragment types are created equally. Some form of them, or some compound or mixture, will cause more severe illnesses that we will be unable to piece together until it is widespread. That's an easy prediction – so harder, I put plastics and other endocrine disruptors as among the most likely suspects for a universal drop in worldwide male fertility (a phenomenon almost everywhere, rising universally, but also physical in nature – ie, detectable in related tissues like testes/testosterone). This will be confirmed by similar rises in wild animal populations and I'd expect that any moment we'll link societal drivers for less children are combining with a decline in natural biological capacity that has been rising for nearly every male creature.

- A problem humanity has had all along is that if somewhere is hard to see, we don't bother to look. With this guiding star, methane hydrates will remain unknown to us right up until methane shows up in the atmosphere en masse (I guarantee a small amount is already there) and that's assuming it even DOES show up in large numbers. Given that we have evidence of hydrates both disassociating and migrating now, I'm pretty confident that if we did look we'd find: hydrates have never been as stable as we assumed, and even if they don't all dissolve in the next

50 years, we are going to find a field, a region, a zone that has already been shrinking in the past. By now its likely several regions, or will be shortly. Changes to an ocean current, or perhaps to the sea ice structures above it, or even to a local water column will have started a process of sustained release we can measure. This isn't just the localized plumes or hundreds of methane columns we've already spotted, this is an entire field of a single hydrate 'zone' falling apart, absorbed by waters at first but nonetheless releasing its matter faster and faster. We will likely be able to map one of these by 2030, even if it doesn't all 'turn over' at once, and as the same general chaotic conditions spread through the ocean system, more events will occur. Full methane bomb fears are generally pushed back due to deep sea stability and vast sediment pressures - I challenge these assertions right now. There is some evidence of volcanism increasing due to ice shifts caused by earth energy changes, and if that ladder of cause and effect can occur then I say it won't be the only type of actual physical earth shifting. Reduction of ice on soil and sediment pressures and shifting currents will combine with heat and to my eyes this sets the stage not for a general system release at once, but for regions with the potential to transition quickly. Where and when I cannot model, this is chaotic interaction, but I think we'll see something like this soon. It may actually be correct that only 3.5% of total hydrate volume is possible of firing any time soon, but that alone is sufficient to kill us all and it is already firing *now*. And there are still large scale dynamics to this system we do not understand or even have on our radar, like the potential for physical destabilizations like fracturing and calving of exposed deposits.

- Unfortunately methane in subsea permafrost is a bit easier to predict – as the 'caps' at the poles vanish, warmer water and less pressure are going to be the natural results. As the plume in Antarctica shows there are dynamics to ice sheet loss not modelled, and as sediment and shelf pressures shift, we should expect a spreading root system of methane release. Shakhova will be vindicated here, and we will find not only the pluming in her region has continued since first observation but that it has expanded and increased in magnitude. To be clear I expect that a good analysis will show >1Gt of subsea methane has already been released, likely all in the Siberian Traps/ESAS, and that we will have a larger release before 2030. If we are going to find a sea greenhouse effect, I anticipate it to be first noticeable at the poles, in the waters near or around these methane beds. Happily, Antarctica is slightly less vulnerable due to depths, but we are even MORE blind there and when the ice loss here becomes as catastrophic as the north (again, I'd expect to see the loss of most or all sea ice here for the first time before 2030) we'll be surprised by wide spread pluming nonetheless. Antarctica ice hasn't 'receded' for a long time and so the methane reserves beneath it will be massive. As heating at both poles is surging past all predictions by several factors (4x is a good estimate) releases here will not be 'few and far between' now. I'd in fact expect all methane to disassociate at the poles long before anywhere else, and one pulse can quickly birth its neighbor here, and will do so repeatedly. Right now there will be fields hundreds of miles long releasing, and we will have a complete release cascade at the poles well underway by 2040 I'd think, with permafrost on the ground and the seas releasing enough methane that the 'pole' heating factors surges ever higher. It's quite possible this has already contributed to one reason why the poles are so much

hotter NOW, and soon both poles will be our glimpse into real heat lensing effects. As a note, the threat at the poles alone is likely civilization shattering in my estimation.

- A number of separate disorders, think MCAS, long COVID, fibromyalgia, ADHD, will be found to be multi-phasic not just in systems effected but in causation. An interplay of environmental exposures and pollutants will be the primary cause for at least a few such diseases and of real importance, the persistent nature of a few of these illnesses will be not because of persistent exposure, but because the exposure persists and accumulates. Micro plastics cannot be cleared, only resisted as the dementia brains demonstrated. Some other pollutants will act the same, and even diseases like long COVID that have an infectious trigger may not be as simple as no disease before > disease after. New syndromes and disorders are lurking just below population detection and when they are spotted their nature will be a mixture of exposures. Given the rapid increase in environmental factors at least two of these new disorders will be active right now and grow to visibility by 2028 or so. I think de-myelinating disorders will show a marked prevalence at any moment, if not already.

- Everyone gets sick. It's a simple statement and has some recognition of rising risk now in swelling disability, cognitive challenges, ADHD, autism, falling healthy years, etc. What's important in this prediction is that health difficulties become omnipresent at some point, literally *everyone* alive gets sick with multiple somethings and in the near term. And the human race as a whole will get sicker compared to our past selves, and 'unexpected' deaths will increase as a result. This is a specific prediction that the curves of disability and illness will accelerate non-linearly alongside environmental exposure, and that given most medical data is synthesized from four or five years ago I expect such a pattern would become increasingly evident should we be able to see the last few years. I bet if someone simply mapped chemical production and population disease incident together we could couple their rates, right out of Limits to Growth. Someone should do this. It should be noted that the worst implication here is that medical intervention continues to degrade in a way purely outside of the control of medical professionals. We're sick and won't get 'better' as a species, because our surroundings are sick and there is no intervention for sending a patient back into the soup outside.

- Speaking of deaths, the death rate overwhelms the birth rate at some point before 2030. And I don't mean in a few countries which has been the case for many years now. The worldwide death rate instead will overwhelm the net birth rate, and we won't know it for 3 or 4 years after (if ever). I wouldn't be surprised if we've hit this fulcrum at any point since 2020 but it's the steady decline I most care about. This will be the population point where it is clear that general complexity growth isn't sufficient to overcome complexity unravelling. Given that more people have entered famine each year since 2020, more at war, and that disability rates have risen each year, we can already craft a picture of more people 'at risk.' Well the next step after 'at risk' is 'risk has hit,' and we will (most of us) living right now be this shortly. This prediction will be impossible to identify on anything but a population level due to the pure amount of threats, but I see the population peak as within +/-3 years of now (2025). This places us ahead of the Limits to Growth by a

fair amount, and I recognize this. I assert the Limits to Growth will end up being conservative (even if remarkably prescient). If it helps, I think *I* am still being conservative in this document, but I am trying to wrestle an elephant alone here.

- Wildlife populations are already permanently in decline. I can state this and it's not a prediction at all, it's entirely a record. Do you see how predictive that itself is? Here is an actual prediction then – it's not just that animal populations as a whole are in collapse, or that species that had been considered 'stable' will collapse shortly, it's that *all* worldwide populations are already in collapse and any not appearing to be have simply not be assessed correctly. And here's the kicker, no other species-wide surges will occur at scale in anything but single celled life. The rise of acidity in waters will not allow an explosion of jellyfish. Bees and wasps will not be expanding their territories and mosquitos will not be appearing at scale in Britain and Norway. There are simply too many unaccounted negative forcings acting on each species now and a free niche is not a niche at all – if there is an absence in an ecosystem it is because there is no web of life to something there any longer. *The very substrates of life are now poisoned or gone or within years of it*. Far from missing species, we have been even more blind to the infinite connections of ecosystem and have not comprehended that when every thread is under assault no other system is going to be able to buffer or assist in adaptation. This prediction expands to the plant kingdom as well, though perhaps slightly delayed. Trees will not be expanding to the boreal tundras as they do not move at the speeds the temperature is now shifting. Note this prediction does not hold universally across locations, but on a system level the most resilience we'll see are 'pockets' that have bursts of new complexity but are simply delayed in their eventual unravelling. And I would say no more than 15 years. Luckily there may be pockets of complex life in the deep ocean or sealed in the earth that bucks this trend, but If this prediction seems otherwise severe let me point out that in many instances populations are functionally extinct already, and that persistence in a pocket is not the same as a thriving species. One of the best bits of evidence for this is that over 120 years after creating the modern concept of the 'preserve,' populations of all animals continue to plummet. There are less African elephants in the same Kenya preserves now than 10 years ago, and the same is true for nearly all protected species. Some quick math from the WWF – 70% of animal life gone in 50 years. That's about 14% a decade, or 1.4% a year. But that's back loaded, or to put otherwise accelerating. So more like 20% in the last decade. Which means, carrying it forward just one more decade with further growth = something like 96% of animals dead by 2035. And that's using their own figures and none of mine. Extinction debt has already claimed most lifeforms and we're just not following the math out.

- We will let each other starve in large numbers, 2025 and next year and on. This one surprised me each time I arrived back to it, but at the core this prediction is the acknowledgement that food aid is largely being cut worldwide (Russia, USA, China are all reducing food aid as of 2025) at the same time that famines are returning. In fact, the famines appeared FIRST, which means governments (or should have) knew what they were doing. Global production figures of stable crops are shaky right now, but not falling actively (just not growing). Inventories are reducing however, so there may be some recognition of instability about. More significant however is that as the primary current driver of food instability is inflation + weather, and yet

the root causes of neither are being addressed at scale (only within a nation). So less aid + increasing stressors means that not only does the famine increase next year and after, but that when the famine gets to size to be noticed again there won't be reserves for addressing it that governments find acceptable to pay for. With everyone already at record debt levels, and inventories low, costs to avoid each famine spirals. And even if an individual famine is avoided, aid won't be provided at scale for the necessary 3-5 years to build back resiliency (which indeed *can't* be brought back, due to changing weather and disrupted transportation). Worse, because we are allowing more food insecurity inside our own countries when it hits elsewhere hunger will carry less general weight. Food insecurity will be 'old news'. Given the likely fall of Iran, and the expansion of attacks on the remains of Palestine, and that the Sudan and Yemeni wars will only expand, 2025 should see a surge of another 150 million or more in hunger at least. And so if we try to look just five years away the trend line shows us likely several billion might be starving – if of course, they are still alive.

- Private equity has been suspected to move into food in a big way over the last 5 to 10 years, buying up mid-size distributors and farms as well as manipulating markets and I will predict the infiltration is much larger than suspected. Low food inventories and the ability to buy the few remaining producers (vs historical levels) is a simple value proposition (see Blackstone's 2x acquisition in 2021 during the pandemic). This makes some farmland now owned by entities with priorities different than food and nationalism, and further price altering will result. I am not saying investment will intentionally crash or short food at scale, instead food production and industry will receive much the same inflated interested as homes now do. This is a hallmark of a collapsing society, consolidation from owning factories and hotels and complicated industries to pouring money instead on the simple things – products that still function as infrastructure fails (as in banana republics). Notice the retail and office vacancies that are rising in many countries. But finance in food is going to particularly swell and cause unforeseen consequences. Think of how EA has bought up game companies for their labelling, only to fire studio after studio rather than continue product lines, only now it will be CocaCola owning Tyson + Beef + all the water and then removing options one by one. The public perception of food is often that when food becomes rarer than it should, governments can step in and make food public, but I think the lessons from Sri Lanka should tell us differently. Now when a government goes to interfere in food they will find corporate consolidation has rendered the process impossible to control. Fertilizers come from overseas, seeds come from overseas, and a state cannot seize a company's overseas assets easily. And making an industry from scratch can take decades. Food is now, and when something happens to Morocco, or global shipping, or foreign currency reserves, we will see an entire nation descend to food insecurity as all its agricultural industries collapse at once. This is likely at any point now, with several small countries currently suffering and Brazil or Turkey or Mexico or Egypt or India all possible next. It is not that that food won't be available at first, it is that food will be continually repriced in such a way as to maintain plenty for an increasingly smaller few. Homelessness will explode of course, and I'd expect >20% y.o.y. growth from now on in any nation. What is still available at the basic income levels will become decreasingly basic, unhealthy,

overpriced, fewer options, and already though food is one of the most essential items it is left out of many indexes, letting the rise there be invisible so as to protect regimes. Expect food desserts to soar and grocery chain consolidation to accelerate, and as a result supply chain issues will continue intermittently from now on worldwide. As food banks reduce locations and offerings, and then finally close, at last populist anger rises and government turnovers become constant in whatever elections remain. Food\inequality\anti-establishment riots in cities give way to further authoritarian crack downs and of course, local inflation rises that become systemic. The US will especially face oversea shortages in the latter half of 2025, and food inflation worldwide will not be returning to 'normal' again (I generally expect food inflation to track 2x or more of 'core' CPI almost everywhere). Food is expensive from now on, and will never be cheap again. Be aware that food is very much a 'doom loop' scenario – should Turkey fall out of the food web any nation depending on Turkey's harvests also fall out. We are experiencing this now with chocolate/coffee production which majorly come from only a few nations. Expect the same with crops we all take for granted like lychees, apples, agave, etc.

-Here's a fun one (at least for the next 3 or 4 years while it still applies)– corporate consolidation will continue, less and less companies yes, but also in a strange growing multiverse of fiction. Each time a new entity is absorbed into the Borg of central companies we'll get more Spiderman/Darkwing Duck crossovers. We'll get more Usagi Yojimbo in our Tony the Tiger cereal. Humans will cling more and more to a few marketable ideas, letting them mutate only enough to rub against other comfortable ideas inside of controlled playgrounds. If this continues long enough we'll get Fortnite everywhere. Marvel and DC won't just have a 10-part series of movies, they'll do stage plays with Dr Who and the Transformers, and a battle royale between every mascot ever. We will have infinite permutations of only a few central ideas which leads to an observation - I described infinite diversity in infinite combination from pollution and that's what this idea is too. Combinations escalating fractally but only in subjects that are comfortable, and with reboots there to pull back to baseline whenever engagement falls. A regeneration we can't manage in real life, how odd. It's almost like we can see the chaos patterns in our fiction but then not apply them back to reality. I say (in part) because of bias.

-Corporate systems have long surpassed many governments in term of power and influence, even from the lens of per capita engagement (as example, Spain has 50 million citizens, while Tiktok has 1.8 billion users. How much does the average person use tiktok? Probably very much less than they use Spain's power and police and roads, etc. But here's the thing, other nations have those things too. So Spain might not be as 'essential' as it thinks). One problem with this is that while a country is nominally controlled by its citizenry, corporations can be multinational and controlled by foreign concerns. This will lead to a complication when nations both fragment internally and fight amongst each other. CocaCola might abandon Africa as an example, which doesn't sound bad until we realize most water production facilities there are now CocaCola run. And this won't matter to the American company hq. Starlink will not just abandon Ukraine and Pornhub won't just abandon France, instead Wesfarmers will abandon Israel and Nutrien will abandon Russia. Gazprom is already abandoning Europe, so this has started, but as wars expand and consolidation continues in just a few years we're going to see a

shipping company abandon the strait of Hormuz and all goods will go up 10% everywhere. Because the company isn't controlled except nominally, and because seizing control of that company would cause a shock that a weakened nation can't handle. And if a nation is strong enough to seize a company? It will do so, and cause a shock that hits all the other countries who couldn't.

- On aerosols I generally agree with Hansen and Simmons that we've gotten the strength of their cooling wrong, however I also predict that even Hansen is wrong about *how much*. In a scenario where we didn't have to worry about any other factors, I still think SO2 aerosols are too complex to accurately calculate to a mean given how much we put out and how widespread their effects are. I KNOW we don't even accurately assess how much of this aerosol we've put out, as keeps being evidenced by actual contrail counting or direct ship measurements. And remember there are more aerosols at scale than just SO2. So how can I predict from this? By (attempting) accounting for chaos and bias. We have been undercounting more than we've been over counting. We have assumed better more often then worse. So quick adjustment is that we assume we DON'T understand these fators, and we're not even 'done' with the full heating of our SO2 reductions yet. We get another burst of localized warming over the Mediterranean in 2026/2027 too, and when pollution is forced to be reduced by power cuts and fuel shortages, we're probably due for 2C+ from just that total aerosol reduction (1C is the general IPCC estimate of all aerosol forcings and so we go bigger). Let's see.

- I have encountered all manner of disturbing predictions on cloud feedbacks (even for my calloused hands). An example, some models suggest at around 1200 ppm CO2 most clouds simply vanish from the skies, causing 8C+ of temperature spikes. I'm not sure how that maps to periods like the Cretaceous or Devonian with much higher CO2 - all sorts of 'facts' must be wrong here, but which? What I am certain of is that some CMIP6s were discounted for having higher warming but ALSO had the best cloud modeling available then. So I'm going to assume there's a cloud feedback, and it's potentially quite high. But more, humans also measure heating as CO2 and CO2 equivalent, but we've gotten both numbers wrong, and we've got an uncertain cloud feedback that depends on those figures. I don't like that math. All these variables to me suggest a crazy chaotic system, so that's what I will predict here – answers no one saw coming. Results that we can only piece together later and that *do not stay constant*. The really resilient ridge off the west coast? Could vanish at any time, or solidify much worse. Likewise the weather resulting from this change will not be what we think, there are simply too many variables. Even if we get some general forecasts we expect, more heatwaves or more water, we're going to get them in ways we didn't anticipate. And patterns we can tease out in time will never come, as the system will keep changing. This is fluid dynamics. I remember reading once about thousands of ceratops found in Drumheller with craters caving in their 6" thick skulls. We think humans think we have seen weather and we have not – hence cat 6 hurricanes sure, but also hurricanes in the UK, in the PNW, that somehow manage to push across the equator or 200 miles inland. We are going to fail as a species before we correctly model the chaos coming in weather and clouds.

- I am worried about air temperatures but not as much as you might think. This is the part where you probably expect me to predict 5C in 5 years yes? Well I do think we hit 5C (and more) eventually, but I don't think it's tomorrow. I don't think even 2C (as a 12 month running average) is tomorrow. I maintain my original whiteboard prediction that 2026/2027 is when 2C starts showing up and then quickly settles in. What worries me most about temps isn't that we can't measure increasing rates (we absolutely can), but because we can't really predict what those rates *mean*. Say 2C to most people and it doesn't mean shit in significance and yet everything that's happened to the climate so far is 1.5C or less. We do not as a species understand what little movements over a giant system means, so if by 2030 we're only just 'dipped' into the 2C pond, we'll think, no big deal yeah? To confuse the understand even more I predict heating comes unevenly and in lurches, which at first people will try to tie to specific events and fail (as I think they did in 2023). We'll look for specific 'feedbacks' or 'thresholds' that cause the leaps, but instead miss that the leaps aren't one cause but wobbles in a system with 100 feedbacks all of which have all been firing for decades and are accelerating more. Don't get me wrong - a BOE will make each summer a leap, nuclear war, a temperature threshold passed for the Amazon, all will be noticeable. Yet realistically there are now too many strands for us to pull them apart with certainty. So temps go up, and not by .43C/decade, but something more approaching the .11C/year we had in 23/24 (again), and then ever faster. My simple math metric is (growth rate in EEI) = (growth rate in air temps). I know this is 'too simple' but to be frank no one has been measuring EEI right anyway, so I'm not convinced we shouldn't watch one pressure gauge in anticipation of another's movement. Time to reanalyze this machine. When it comes to air temps I'm also quite worried about the oceans, and specifically the ratio of energy going into the oceans versus the air. Quite unexpectedly (for me at least) right now it looks like the oceans are starting to absorb MORE heat than they did previously, and so air temps should be up more than they are. Good right? Except I don't trust it, or the mechanism, or that there aren't other thresholds that reverse and boom, we're up .4C in a year because the oceans have flipped again. I know we spoke of this, but it bears repeating. It is a *nightmare possibility*. Still, if we follow 2C by 2027, it's not for a year or two after that before I expect temps to really start rising. Think of it this way, whatever sum of forcing you like got us to 2C by 2027 yes? Now add (that forcing) + termination shock beginning (I estimated 2C total here before) + however many Gt of methane from permafrost+hydrate + BOE + 2Cish soil feedback = additional forcings by 2040. Maybe you want to discount the hydrates and permafrost? Sure. BOE too, ok. Soil feedback is a bit harder to dismiss, but we can say its small per IPCC. But then even if you want to use 2C by 2030/32 per Hansen, you'll have to consider adding a .5C termination shock before 2040 (per LTG – after all, the people are starting to die and that's because the systems fail beforehand). So super conservative? 2.5C by 2040. But this whole thing has been about how they're wrong, yes? So it'll be more, much more. In my estimates it'll be closer to (and above) 3.5C by 2040, but I could see all sorts of numbers here really. Just one feedback going a single order of magnitude larger than we though, and we end up with crazy numbers. And after that there's just little point in estimating. In a systems view we don't need the heat to kill us, and yes, by the time 2060 hits and the full force of methane firing has started, then everything larger than a microbe is

irrevocably dead. But keep in mind that we're in systems mode elsewhere too – which means we get to realize that the heat that's coming isn't universal. It's regional, and temporary (ie moves through time). So heatwaves that specifically melt a spot (like a hydrate or an ice cap) are perfectly possible and will cause giant destabilizations more like explosions than inflations. Similarly, heatwaves that kill a million people will happen any day now, and power grids will fail permanently when the hardware gets hotter design constraints, and then we get to see a nation or region gutted. All this by 2027 I say. Maybe then '2C' will get a face.

- Our last years are going to be our most polluted. Well of course, pollution is probably the top thing killing us, and yet we all know we'll be polluting THE MOST in our last functioning years. We're not going to 'pull back' at the last moment but still have too much inertia pushing us off the edge. Instead I predict we'll be accelerating right up until the moment the power turns off, and after *that*, while pollution as a whole might drop, we'll be busy burning every last tree for warmth and then we'll burn plastic and metal and each other if needed. The 'plan only for now' driver only gets louder in desperation and governments are mostly too paralyzed already and so a good indicator of collapse is that smaller problems (that aren't really small) get tossed aside. So not only will we keep polluting, I guarantee we pull back on our laws preventing pollution and go all out. To keep lights on and food flowing regulations will fall left and right or be ignored all together, worldwide. And then when the reactors melt down, we'll be polluting even in absenteeism.

- COVID never left us and never will. And the interesting thing, since the virus can repeatedly infect and damage us, each infection was just itself a different 'stage' of the same illness in individuals. That means we probably haven't even seen COVID's full form yet! With our artificial antibodies failing to prevent reinfection at scale (though generally stopping 'severe' disease), we have engineered a scenario where repeated damage to immune and epithelial systems (IE all of them) means we jump the evolutionary war straight to becoming like some bat populations, sick and dying our whole lives. Just COVID alone does this to our race, and if everything else were fine I'd still expect a noticeable difference in population health and mortality levels before and 20 years after COVID. Sufficient biotech might get us out of this at any point but more likely COVID makes a few more mutations by 2030 and instead we get a continual degrading stress on hospitals/daily healthcare/workers. No steady 'sickness' here, but only active decline, with hospitals and medical services having peaked worldwide BEFORE the pandemic, not any time after it. And all of this ignores a nightmare mutation like we're waiting for with Avian flu, the sort of thing to really drive home our stupidity with defunded research and pandemic preparations.

- Industry worldwide is going to remain fully coiled with fossil fuels right until the end. This means industrial outputs only truly stops at scale when oil stops flowing, and not from the wells but from between refineries and markets. A green revolution will never exist at scale, and most numbers that point toward it are self-reported by the same folks that said their wells put out 1/7th of the methane that they actually released. Green electricity may give us a bit more reach but as an example the hydro dams in Washington state would all fail in a day without diesel and gas – the workers couldn't get to them, the part replacements they require couldn't be

shipped, the trees couldn't be cleared, etc. And if we get that one system working, we used every electric vehicle to do it. We don't have enough rare metals to get us to even 1 full generation of full green power inside of 200 years (about how long it would take to get enough copper + graphite together), and not because we don't have the minerals but the remaining growth capacity. And so we're not going to magically pass 30% renewables (as the whole energy system – including transport, food, materials as well as power) inside of 5, 10, or even 15 years. Instead I don't see us getting any real resilience expansion here at all – if anything the brittleness of newer (and thus more 'network integrated') technologies is going to expose us to even more overseas disruptions. Think the Crowdstrike outage and you start to see that a diesel truck is going to be needed when the Tesla doesn't start. We are going to have to fire up the old gas guzzlers even at 150/barrel if only because the processors and the solar panels and the very wiring are all made elsewhere, and we need a local solution.

- Debt is a problem, and it will have physical consequences in paralyzing those last moments we might act. Perhaps the best way to understand debt as a problem is to recognize how everyone says it is and yet can't ever agree as to *when*. That means debt itself is a mammoth conservative bias, a unified delusion that something bad might happen somewhere but not soon, so fuck it let's keep going. Given that debt is mostly theoretical, a mass agreement of humans, I've often been tempted to agree that maybe huge debt IS ok when compared to micro plastics, but no, this is a systems analysis. And that means debt is also planning, and information, and its expectations resiliency for some functional parts of the economy. And that means debt is going to be a problem too and likely a problem BEFORE lots of other things are. It makes sense - it's hard to pay attention to something like debt when you've not eaten sure, but your landlord who *has eaten* still cares. This patterns means I would put the debt strand before a lot of the LTG indicators, but still there as an accelerant (like populism) or a control system for other systems (like paralyzed governance), and perhaps the biggest proof of this placement is that debt exploded worldwide just as EROI started to diminish (i.e. the late 60s and early 70s). I often find it useful to view debt as an attempt to expand complexity now when other realities aren't allowing it. Once upon a time we might expand operations by assimilating capacity in the form of cheap oil, or new territories, or unconquered markets, but now instead we just grow debt with less and less connection to 'stuff.' I don't think anyone anywhere has our debt system truly mapped out (see the rise of shadow banking and PE markets) and that makes debt just...such a strong example of why I first needed my heuristic. Of note here is that countries all over the world have been collectively talking about their debt (or even trying to tamp it down) at the same we have the largest number of incumbent wins in the history of democracies (2024). Likewise nearly all major market classes are fluxing up and down while trade wars (and actual wars) expand. Debt was one of the 'glues' we used to drive mediocre growth figures for the last five years and yet the IMF has just now warned that the 2020s looks set for the worst worldwide growth since the 1960s. Do you see the patterns of convergence again? What happens next is that some nations continue to pile on their debt, hoping any growth overwhelms concerns about its weakness, while other nations attempt to tighten their belts. Unfortunate both groups are missing the point – at the same time they'll be trying

for light growth or no growth, what they truly need is *record* growth to overcome rising stressors. They need new infrastructure to replace what was just destroyed this year. They need things they've never had like sea walls and high speed rail and solar power to prevent oil shocks and drought stress. But no one is planning that sort of expansion and even the 'growth' we had for the last five years was all artificial. And we know this because so few physical projects have been done. This is my general assertion here – not that the future looks like stagflation or degrowth (though both happen), but that in fact the recent past has been an illusion as well. The reason Chinese home prices have fallen 4 years in a row, the reason there are more homeless than ever, the reason that populist parties are rising is that the real economic picture, divorced from debt and corporate lying, and unequal distribution, is that the vast majority have been getting poorer and more debt ridden year by year. Industrial output was never the best measurement because plastic toys (consumption) got mixed in with freeways (infrastructure). And we haven't been building freeways for 2 generations at least. I assert GDP per capita has been dropping for years already and we just used illusionary money to confuse ourselves with growth narratives that are now flickering. Inflation seems a good phenomenon for some to blame, but in reality increasing cost of stability IS inflation. And in fullness it's the stability we've lost, and when it's seen that governments (or companies, or individuals) don't have it either, bonds will flicker (NOW), crash (some NOW) and money will pour out of nations (accelerating from now). There will be no winners here is my guess, or maybe one or two as 'ivory towers'. I'd expect those institutions that can best lie (maintain illusion) to succeed, with tech and base resource companies surging as more people double down while so much else crashes.

- There has been some assumption that the wealthy, hoarding all their resources, have plans or awareness most of us lack. Maybe even they have a conspiracy of control or an escape out of this nonsense. This is all just hopeful nonsense. The truth is that many of the ultra-wealthy *do* have bunkers – but that's it. And even the bunkers aren't the answer or even really for the 'right' reason. The wealthy can see chaos, but they imagine castles and command and control centers, when in truth shortly there's nothing that will be left and nowhere (earth-like) they'll be able to 'emerge out to'. I'm not even sure how a bunker can protect you from micro plastic-accumulation and chemical exposures? Seems a place to concentrate them inside yourself to me. In the end we are humans, with human level understanding, and all the corporate apparatus in the world to feed to the wealthy is the problem and not the solution. We will not be escaping to Mars, there are no undergrown cities that will survive for long, and there is no secret plan to save enough of anyone. Geo-engineering will be attempted and yet never scaled up. We can't scale up proven technologies like forestation or recycling given decade time spans, and we do not have that now. Of some interest however, I do quite expect the wealthy to get *wealthier* even during degrowth, and short of populist uprisings they will run for office, suggest (and try to implement) radical but easy solutions, and generally muddy the waters with power grabs and infighting (have you noticed we've already had competing billionaire candidates?).

- There will be no large sustained international movements based around sudden clarity. In fact, I don't believe any societies at scale are going to even HAVE a

moment of clarity. In disaster management there is also a concept of normalcy bias, and most studies seem to suggest that in an extraordinary moment many people fail to conceptualize new reality even worse than in their baseline. Now imagine our stressed individual is also sick from long COVID in that moment, undernourished, and already distrustful of government. Is that person more or less likely to have the biological capacity to tease out a safe path through a complicated scenario? Likewise think of a government, bloated to largest size ever due to population but also recently new to office thanks to (another in a series of) 'upset' elections. So individuals without prior government experience in charge of a government at it's all time largest (or close to it). Would we expect a more nuanced understanding of a rapid situation from this person, or a simpler one? Now simple absolutely does not mean stupid, but please compare to my own heuristic – small rules in practice yes, but to clarify its success took a multi-domain approach rarely seen. If we just applied the heuristics in just say climate science, it would look ridiculous and be much better expressed as mathematics or even just a few model calibrations. Some expression infinitely more complicated but that would be useless at spotting the same phenomena is happening in human health, governance and ocean dynamics. So what happens when mysterious downward spikes are showing up in academic tests, record numbers of refugees are building up at borders and reports of record disaster losses build up? Will those be synthesized into one picture? No, none are directly addressed and we focus on 'one or two things' like normal. I don't think that New York flooding suddenly starts an international conversation on a complexity crisis. Yes, it might start everyone talking about geo-engineering, it might even cause some attempts to be trialed, and yet no one will be noting how sulfur seeding at scale simply spreads another pollutant to now be mixed with the PFOS and micro plastics and lack of animals in empty niches. Solving one problem in isolation does not fight the cascade of them, and like semaglutides may simply add new complexity to a system rather than repair existing complexity. So here's the full prediction – the worse things get, the muddier the picture for us all, not the better. It isn't just biological systems stressed now but also academic and information systems. And no internet, libraries without funding, government databases closing, all mean less information for any team to work with. There will be no greater synthesis at scale because we didn't notice before and now our mechanisms for noticing are degraded. Yes, there will be more pressure to figure situations out, but when the answer is there is no effective answer, humans will resist synthesis even more. We will silo, pick one or two problems as THE problem, and more than likely try to scapegoat even that. This will be most obvious when different nations pick different problems, or when the few interventions we do implement completely fail to address the issue (more guards at the border doesn't stop millions of people fleeing death behind them). Do not expect a conference that 'puts everything together.' There will be no Manhattan projects for a multi-system problem because we couldn't do the domain synthesis when it was easy. Now it'll be hard.

- There are places on earth where the refugee population is already 20% or more of the nation. This will a feedback, with refugees fleeing both single events as well as collapsing societies accelerating the next nation's collapse. And interestingly thanks to geography we have at least a sense of likely progression – after all there

are only so many ships in the world. I would expect Turkey and Greece, and to some extent Armenia, Ukraine and Spain to especially suffer, and any of them is likely as 'next to fall' nations. Like California cities in dust bowl years, when camps get large or widespread enough, expect governments to lose control of regions in a tide that very well could be like dominos falling. There are hints of this now: Cuba has lost 10% of its population in about 8 years, and there are likely 7+ million Afghanis illegally in Pakistan. Greece/Italy/Macedonia/Romania have all had or threatened far right governments worried about refugees, and France and Germany too. But all of this has just been from a few small national failures, Syria and Afghanistan and Eritrea. What will happen when a large nation fails? Pakistan and Iran are almost certainties, but others might be Bangladesh, Mexico, Bolivia, Columbia and Egypt. When populations at that size flee, a million refugees might show up to a border within a few weeks. One of two scenarios seems most likely then, either the refugees overwhelm the guards and make entrance, or the guards manage to force the refugees back. But how does one stop a million people? Or more? At some point raw brutality likely needs to be used and here is another feedback: brutality means training your army to attack civilians > it also means more protests within your nation > this gives more reasons to 'crackdown' > more refugees. Regimes attacking civilians is a cycle that gets more civilians to flee, leaving nations that crackdown more secure in the moment yes, but it also means that nations that do no crackdown risk becoming overwhelmed as a 'safe port.' There is some sign of this already, with the US seen as a destination while autocratic regimes are avoided. And so here's the prediction; increasingly we will now see either a constant vigilance of brutality that tries to 'seal borders' or nations too porous to prevent nonstop influx until their society is overwhelmed. And back to geography, not all borders are created equal. I don't anticipate there is anything Turkey could do to seal itself. The same with the Russia, China, India or Brazil. There is some possibility of the US managing, but only if Mexico can assist (and so stays functional). Reality will become even more chaotic however when we consider migration and fleeing *within* a nation. Consider Paradise CA still has not recovered, and many Chico hotels still have survivors. And unlike previous internal migrations now there will be increasingly more in number, from larger regions, and devastated by shock events at speed. The time between shocks will be shorter too, and even now some areas are being flooded 2 or 3 times in a single year. As soon as climate chaos permanently destroys enough of a nation's infrastructure, at that point I predict it is cities that will have to be sealed, rather than borders. There will be too many in need and so again we end up with a situation like South Africa. I believe a real accounting of refugees today would find they have non-linearly surged since 2022 (at least) and are many tens of millions more than officially accounted. Expect increasing complaints to the UN, border closures as measured by mileage to surge, and the first military attack on a refugee camp (outside of Myanmar) likely occurs any time now. Governments worldwide will increase refugee crackdowns and yet still find numbers rising.

- Populism isn't done spreading or doubling down. Expect the number of populist candidates to rise worldwide, but there will be some surprises to the WW2 formula. Firstly, while populist candidates might win, I would expect them to quickly lose as well. Populism is simply easy answers and we now are in a world where the easy

‘abroad’ answers aren’t effective (nations are more equal and intertwined, wars are more expensive and don’t function with nuclear arms). If a government can’t produce results like Hitler or Mussolini quickly did in their rises, then I expect the public can turn on them as well. And while the internet allows ‘candidates from nowhere’ it hasn’t built strong party support too yes. So with less international foes available and less robust apparatus, I’d expect populism to focus even MORE THAN BEFORE on alienation – Immigrants, trans, gays, different ethnic groups, all become enemies and unifying points. Trans legislations will follow the classic ladder of banned from sports/bathrooms > banned from government > registered with government > isolated from society > worse. Refugees, as they rise quickly, will have it even worse. And punishing people will *look* like taking action. Destroying government norms and attack will be the only real capability of populism and both will be feedbacks, with nations targeting their own populations and casting refugees to their neighbors, who will likewise crackdown and so on. This continues until either militaries fall or are toppled by a critical mass of people (like in Bangladesh, however temporarily). This will be perhaps the most dangerous ‘human’ tipping point of the next 10 years (I give no government longer than that). The reality for everyone is that we’re already past peak resource extraction and our spaghetti meal of problems can’t be attacked with weaponry. So how do nations collapse? We don’t need to imagine here; again we’re starting to see it already. South Africa sits with government paralyzed and infrastructure failing, with ‘enclaves’ formed around the wealthy where many services still exist (generators/private security/etc) while everyone else just makes do best they can, but still degrading. In Venezuela and Cuba some cities remain with power mostly on, but the countryside is often dark. Conversely Ecuador’s government remains functional, but 24 months of no rain means no power but the most ‘important’ places. And think, Venezuela’s collapse meant Cuba couldn’t buy from them. In these partial collapses is when populism threatens most, as efforts push ‘tentpole’ campaigns (think the Holocaust expanding even as Germany loses its wars). Here’s what I expect: In the US there will be an overreach of executive power to the point of a 3rd term, and/or a declaration of martial law and military rule. Trump never set out to be a dictator and yet neither did Hitler, and yet look what victory after victory does to goal posts. Refugees will overwhelm Mexico from within and without, and gang violence is entrenched enough there to pull the government fully apart inside of a bad year. Australia’s shores will be impossible to close and the nation will be overwhelmed as soon as Indonesia falls. Until 2028 I do expect the majority of nations to proceed most like the UK, a series of ever more powerless governments and a relentless eroding of standards of living. 1st world nations that have fought off populism so far like Canada, France, Germany, Japan, all may have to accept a stark and startling rise to problems and lack of answers for a few years, and then proceed from there. I would expect new failed nations every year now, and a steady erosion everywhere towards national > regional > local > neighborhood governments only. Like Haiti, by 2030 it’ll be your block versus everyone else for the majority of Earth.

- I have some general sea predictions that don’t quite all need their own specific section, so here goes: the loss of marine life + the failure of international governance will mean Chinese ships (even more) at scale crossing waters and causing incidents. As fish farms in the water become more dangerous there will be

outbreaks and ‘taintings’ of fish related products and a general collapse of fish available. This is happening now and at scale within a few years. No fish of course means rising hunger and more fish farming, and yet reliable zones are already vanishing, adding to food inflation and shortages. I expect a minimum of .25C increase in ocean heat by 2027 and likely more. This likely means the tongue of Thwaites is gone entirely 2026, and ocean currents are right now different than calculated. Luckily ocean currents don’t just ‘stop’; still like a worm stuck in the middle we will miss when the currents flail about at the ends. A statistical analysis of multiple ocean currents today would show across the board weakening or drift and I expect in the new few years we’ll discover a major current has already changed its general flow path in the past 2 decades. Coral life forms will be mostly extinct before 2030. And just as bad a full accounting of 2024/25 will find the crisis in Galicia and Alaskan fisheries, and in herring populations in the North Atlantic and the algae blooms in Kangaroo Island are all statistically common events now. Not actually exceptional, but only ‘here’ in our attention. The oceans will not be stabilizing unfortunately and ocean tours will continue long past the point where every natural harbor and snorkeling site has gone quiet.

-I have a specific prediction about the future that I do not see described as a planetary danger, but is, namely in the disseminated nature of network dysfunction. Resilience is often talked about as an exercise for communities or individuals, or occasionally (like in Finland) a national priority. Our heuristic suggests such efforts might misunderstand resilience entirely. Example: New Zealand and Australia, two of the richest and yet most isolated of the major nations, both with small populations with a history of radical resilience. And I will tell you what anyone in the outback surely knows; that both nations will fall quickly in the next 10 years. Unfortunately no one I know of has bothered to map out the full connections between nations at scale, let along their magnitudes. This is an error. Some examples: 50% of adults currently have a prescription medication, 70% of the phosphorus fertilizer in the world comes from Morocco, 80% of all chemical precursors come through China, 70% of all generic medications come from India. So here is a prediction - resilience at scale is a myth anymore. When Australia and New Zealand were sealed off from the world during COVID, ships were still arriving to both constantly. And if those ships ever DID stop, both countries would immediately need to revert to no medications, no fertilizers and no advanced manufacturing. Populations would plummet inside of a year, if not even less, and keep in mind both nations produce more than enough food to feed themselves in 1 harvest. But with no fertilizer there’d only be one harvest and no others. Unlike the myth of animals thriving in collapsed environments, I assume humans are just as vulnerable as any other life form. Only our technology alone has let us persist through the anthropogenic extinction so far, but when technology starts to fail, we will fail too. And today technology is inherently based around the network. Imagine – if Microsoft goes offline, how many nations will lose central access to almost everything they do? When cloud services go down, is there a local server to maintain functioning for pharmacies? The disseminated dysfunction prediction at its core is that damage is going to spread across the network of technology faster than anticipated, and that this damage will come with physical consequences that feedback and create more dysfunction, but at network speeds. The Crowdstrike

outage is a perfect example – one error in one location cascaded across the world causing billions of dollars of damage in a single day. And this was a systemic 'within realm of functioning' error. What does cascading physical error without repair look like? It's not that one nation will lose plane flights – it's that whole continents will. Maybe the planet. And all at once. When command and control for a satellite network goes down so will every system that uses that service right? The nature of managed services as a component of industry was that parts of the process can be managed by someone else somewhere else. And get this, we've even disseminated knowledge. I have seen this at scale, with IT services a thousand miles away from the location, or the only knowledge of how to do something sitting in a wiki or a database and not in a written file. Or even as an AI irreplaceable service that exists solely in the bowels of US WEST 1 out in the fields of Yakima, WA. I ask - do you believe in power outages? That's all it takes for AI services to go down and knowledge to not be available, and remember all the workers were fired. Who do you get for when that service goes down? I suggest for that moment we don't even go back to 1980, we go back to 1780 because we forgot how 1980 works. When India goes down, American support services stop and can't be scaled back up immediately. When AI services in China go down, hotels, customer service and trading worldwide suffer and don't function. Cascade will spread farther than anticipated in human systems entirely because we have designed disseminated human systems. There are only 200 major data centers in the world – do you see how this is more fragile than 8 billion individuals? Such a node-lite network plunges either in just a few hits, or even all at once. And maybe some small amounts of it could be adjusted to function locally, but all the capacity of before? No. We either revert quickly to 1980 or we lose capabilities entirely not to return. And *fast*. Think of just New York. If there is no Wall Street, where does capital flow? Who knows who owes what to whom, and can lend to everyone else? Suddenly everyone in the world has this same problem, and they must all now overcome this dysfunction together. If they weren't linked, they wouldn't have this problem, but now? Now people have MORE problems when there is chaos, not less. I view this as the nervous system in a life form, yes in theory the liver is fine if the brain dies…but in practice? There will be no food, no oxygen, no coordination of any kind at scale. We can argue about resiliency for the remaining 15% (the approximate population before fertilizer and antibiotics/medications), but we'll likely have to plummet from now to 15% first.

- The Last One.

So far all of these predictions we've made are just (mostly) from 'known' quantities. Systems we're aware of and dynamics we at least have some sense of. Now keep in mind that these are NOT the only systems on earth. We live on a very large stage and a black swan or shock event could happen at any time. Avian Flu seems much more of a 'when' than a 'maybe.' Likewise a magnetic pole fluctuation or a Carrington event could at any time hit Earth. Asteroids, supernovas, volcanos and pure human accident could all be added to our situation at any time. This is why you keep a system stable, so it can absorb hits better, but right now it's hard to see how such an event wouldn't just push weak systems even faster towards disintegration.

Along these lines there is a threat I have generally kept on its own, though it is in no way ‘special’. It is in fact as predictable as the others at a systems level, but it’s also so concentrated as a force multiplier that it’s difficult to see just how it’s application plays out. But we’ll still try.

More populist leaders, more conflict both within and without a society, more resource shortages, more climate immigrants, more polarization and more attempts for easy answers means the deterrence equation of nuclear arms that the world has relied on will be continually eroded until they are likely to be used.

Keep in mind in particular that sicker individuals, with more cognitive difficulties, means more acceptance and use of ‘easy’ answers, and nukes are quite easy, that’s their point.

I wouldn’t expect full exchanges between large powers as long as those powers remain cohesive and aren’t in direct conflict. I do think most people understand conceptually that nukes mean mass death, even if that risk seems far away, and so the first risks are nations with weapons using them on nations without. Israel ‘defending’ itself, Russia turning the tide of its war, China bringing Taiwan to surrender, I consider all of them likely. Along the same lines as chaos rises and regimes fall, the use of a nuclear weapon on a ‘fallen’ nation makes much more sense as forced application of order, even just as a demonstration. But I don’t think these scenarios stay lonely for long.

Nuclear weapons between nations starts to make the most sense when the nation itself is crumbling and deteriorating, and a denial of this is needed. A doubling down towards our enemies aren’t ourselves. This would be the eruption of Pakistan and India, or the US and China, or Russia and Europe. I could see these escalating quickly once real weakness sets in on either party. Or when a new enemy is quickly ‘identified.’

But by far the largest immediate risk of nuclear action is when a nation itself falls apart and balkanizes/becomes incoherent. Then a weapon or several could be used against itself, its neighbors, whomever. As nations themselves change the calculus between friend and foe and threat is ‘rewritten’ on the fly and often will come with very little time to think/plan/maneuver. Why not use a nuke if it seems your regime is short? Why not hold others hostage?

Add to this the reality of nuclear power plants, poor maintenance, and falling supply chains. Many nuclear reactors cannot simply be ‘shut down’ without significant preparation and there is nothing special protecting these technological nodes as networks and governance fail. This means there will be accidents, unintentional meltdowns and eventually a cascade of them. Most active reactors have long lived past their planned lives, and so expect a ‘disaster in slow motion’ in a few instances. Reports of a plant in danger over and over, but saved (just like Zaporizhzhia) yes, but also of single points of failure highlighted but never made secure. Supply issues, personnel issues, constantly changing hands between warring factions all might result, and then…a leak, raised radiation levels, or a bomb or two in the facility causing damage. And then a meltdown or large release.

More than one will happen shortly, and when a nation of size falls these will blister out over potentially thousands of kilometers. That will be a sign of a dead country, not to return. And when any nuclear nation falters, keep in mind we get a USSR 2.0, a free for all to grab weapons, nuclear material, etc and make it vanish. Only last time this occurred the nations with the weapons were still largely cohesive in terms of population and health and technology. The power stayed on, phones worked, and still we couldn't account for weapons for decades or ever.

Now even those basic tools might not be so reliable.

One final bit to this – I would not expect anyone to know the real results of a large exchange. Whatever (many many) others have said, our heuristics hint such an exchange isn't model-able even on a low resolution big picture scale. 'This many lost to fallout', 'this many months of dust' misses the point that the earth system being modelled in such scenarios is in actuality different than now. No one knows what fallout does to micro plastics that already coat the world. No one knows how methane hydrates respond to forceful erratic vibrations at scale, and for days. No one knows how a food system already suffering capacity problems can function in both nuclear winter and *already existing* supply chain issues.

This is like trying to map past 2040, I'm not sure there's a point. Even if we survive the radiation, all the other threats will likely still be active right there too.

So there we have it. A lot of this document is unprecedented I know. But so was Israel attacking Iran, and Iran attacking Israel. So was 120F in the PNW. So was Canada being threatened by its closest ally. So is no bugs on the windshield, losing glaciers and most elections since 2000.

And as a point, I didn't even go through all that we could. I have *left things out* like wet bulb temps, or AI disruption of society, or how reward reinforcement works. So there's even more, isn't there?

I think it's time you all admit; it was worse than you thought then. And worse than you know now.

And I implore you, don't just trust me or anyone else. Look, research, question everything, and keep doing it forever.

There is more we could say about…everything, so much more, but I'm tired now. If you do want more you'll have to build it yourself or come find me.

And if I'm wrong, please do better and share it.